



VK MEHTA

One liner MCQs



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CHAPTER 1 V.K MEHTA

1. diameter of an atom is 10^{-10}
2. The number of compounds available in nature is **unlimited**
3. The mass of a proton is **about 1837 times** the mass of electron.
4. The electrons in the last orbit of an atom are called **valence electrons**
5. If the of no. of valence electrons of an atom is less than 4, the substance is usually a **conductor**
6. If the of no. of valence electrons of an atom is more than 4, the substance is usually **an insulator**
7. If the no. of valence electrons of an atom is 4, the substance is usually **semiconductor**.
8. One coulomb of charge is equal to the charge **625×10^{16} electrons**
9. 1 cm^3 of copper at room temperature has about **8.25×10^{22} free electrons**
10. The electric current is due to the flow of **both positive and negative charges**
11. E.M.F in a circuit **maintains potential difference**.
12. The electric current in a metallic conductor is due to the flow of **electrons only**
13. Potential difference has the unit of **energy**
14. The electric current in a liquid is due to the flow of **negative and positive ions both**
15. Electric current is a **scalar quantity**
16. A billion electrons pass through a cross-section of a conductor in 10^{-3} s. The current is **1.6×10^{-7} A**.
17. The electric current in a discharge tube containing a gas is due to **electrons and positive ions both**
18. How long does it take $50 \mu\text{C}$ of charge to pass a point in a circuit if the current flow is 15 mA? **3.33×10^7 s**
19. The specific resistance of a wire depends upon **its material**
20. The quantity of charge that will be transferred by a current flow of 10 A over 1 hour period is **3.6×10^4 A**.
21. The resistance of a straight conductor is independent of **shape of cross-section**
22. A length of wire has a resistance of 6 ohms. The resistance of a wire of the same material three times as long and twice the cross-sectional area will be **9 ohms**

23. The drift velocity of electrons is of the order of 10^{-3}ms^{-1}
24. Conductivity is the reciprocal of **resistivity**
25. The specific resistance of a metallic conductor **increases** with rise in temperature
26. The potential difference of an energy source that provides 50 mJ of energy for every micro coulomb of charge that flows is **500kV**
27. Insulators have **negative** temperature co-efficient of resistance
28. Eureka has **almost zero** temperature co-efficient of resistance.
29. What quantity of charge must be delivered by a battery with a potential difference of 100 V to do 500 J of work? **5C**
30. A piece of aluminum wire is stretched to reduce its diameter to half of its original value. Its resistance will become **sixteen times**
31. Semiconductors have **negative** temperature coefficient of resistance
32. The thermal speed of electrons is of the order of 10^6 ms^{-1}
33. Constantan wire is used for making standard resistance because it has **negligibly small temperature co-efficient of resistance**
34. The resistance of a material 2 m long and 2 m² in area of x-section is $16 \times 10^8 \text{ Q}$. Its specific resistance will be **$64 \times 10^8 \text{ Qm}$**
35. The SI unit of conductivity is **mho/m**
36. The value of α (temperature co-efficient of resistance) depends upon **nature of the material and temperature**
37. A copper wire of resistance R_0 is stretched till its length is increased by n times of its original length. Its resistance now will be **$n^2 R$**
38. The resistivity of a material is $2 \times 10^{-8} \text{ Qm}$. What will be the resistance of a hollow pipe of the material of length 1 m and having inner and outer radii 10 cm and 20 cm respectively? **$21 \times 10^7 \text{ Q}$**
39. A piece of aluminium (Al) and germanium (Ge) are cooled from $T_1 \text{ K}$ to $T_2 \text{ K}$. The resistance of **aluminium decreases and that of germanium increases**
40. At OK, germanium behaves as **an insulator**
41. The example of non-ohmic resistance is **carbon resistance**
42. A copper wire is stretched so that its length is increased by 0.1%. The change in its resistance is **0.2 %**
43. If an electric current is passed through a nerve, the man **BEGINS TO WEEP**
44. Which one of the following is the best conductor of electricity? **Silver**

45. The temperature co-efficient of resistance of a wire is 0.00125 per °C. At 300 K, its resistance is 1Ω. The resistance of the wire will be 2Ω at **1400 K**
46. Ampere - hour is the unit of **quantity of electricity**
47. The resistance of a conductor is 5 Ω at 50°C and 6Ω at 100°C. What is its resistance at 0°C? **4Ω**
48. Fig. 1.16 shows the temperature / resistance graph of a conductor. The value of α_0 , is **0.005/°C**
49. Referring to Fig. 1.16, the value of α_{50} will be **0.004°C**
50. Referring to Fig. 1.17, the value of α_0 , is **1/30 per °C**
51. Referring to Fig. 1.17, the value of R_{40} , will be **702**
52. Referring to Fig. 1.17, the value of α , will be **1/70 per °C**
53. The value of α , of a conductor is 1/236 per °C. The value of α_{18} will be **1/254 per °C**
54. The value of α_{25} of a conductor is 1/255 per °C. The value of α_{20} , will be **1/250 per °C**
55. The value of α_{50} of a conductor is 1/255 per °C. The value of α_0 , will be **1/180 per °C**
56. The number of free electrons passing through the filament of an electric lamp in one hour when the current through the filament is 0.32 A will be **7.2×10^{21}**
57. In which of the following substances the resistance decreases with increase in temperature? **carbon**
58. A wire having very high value of conductance is said to be **very good conductor**
59. An electric heater is marked 27000 W, 200V. The resistance of the coil is **20Ω**
60. The current in a circuit having constant **9 times**
61. What voltage drop will be there across a 1 kW electric heater whose resistance when hot is 40 Ω? **200 V**
62. A resistor R_1 , dissipates the power P when connected to a certain generator. If resistance R_1 , is put in series with R_2 the power dissipated by R_1 **decreases**
63. In case of liquids, ohm's law is **fully obeyed**
64. Two electric bulbs rated for the same voltage have powers of 200 W and 100 W. If their resistances are respectively R_1 and R_2 then, **$R_2=2R_1$**
65. A copper wire has a resistance of 10Ω. It is stretched by one-tenth of its original length. Then its resistance will be **12.1Ω**
66. The current-voltage graphs for a given metallic wire at two different temperatures T_1 and T_2 , are shown in Fig. 1.18. Then **$T_1 > T_2$** ,
67. 10^{20} electrons each having a charge of 1.6×10^{-19} C pass from a point X to a point Y in 0.1s. The current flowing is **160 A**

68. No current flows between two charged bodies if they have same **potential**
69. A carbon electrode has a resistance of 0-125 Q at 20°C. The temperature coefficient of carbon is — 0-0005 at 20°C, What will be the resistance of electrode at 85°C ? **0-121Ω**
70. The specific resistance of a wire 1.1m long, 0.4 mm diameter having a resistance of 4.2Ω will be **48x 10⁻⁸ Ωm**
71. Which of the following is the best material for making connecting wires? **copper**
72. The specific resistance of the material of wire depends on **none of the above**
73. Ampere - second is the unit of **charge**
74. The percentage by which the incandescence of lamp decreases due to drop of current by 3% is **6 %**
75. What will be the resistance value corresponding to colour code yellow, violet, orange, silver? **47k Q +10%**
76. What will be the resistance value corresponding to colour code brown , black, red ? **TkSQ 4 20%**
77. Two resistors A and B have resistances Ra and Rb respectively with Ra < Rb. The resistivities of their materials are pa, and pb, Then **Information insufficient**
78. As the temperature of a metallic resistor is increased, the product of its resistivity and conductivity **remains constant**
79. A resistor develops 400 J of thermal energy in 10s when current of 2A is passed through it. The resistance of resistor is **10Ω**
80. An electron moves in a circle of radius 10 cm with a constant speed of 4x 10⁶ ms, The electric current at a point on the circle is **1x10⁻¹² A**
81. The resistance of human body is about **1000Ω**
82. The filament of an electric bulb is made of **tungsten**
83. The hot resistance of electric bulb's filament is higher than its cold resistance because the temperature co-efficient of filament is **positive**
84. A nichrome wire used as a heater coil has a resistance of 2 Q/m. For a heater of 1 kW at 200 V, the length of the wire required is **20 m**
85. When 1 V is applied in a circuit a current of 1μA flows through it. The conductance of the circuit is **1μ mho**

Chapter No 2

1. A d.c circuit usually has **resistance** as the load.
2. The purpose of load in an electric circuit is to **utilize electrical energy**.
3. Electrical appliances are not connected in series because appliance have **different current rating**.
4. Electrical appliances are connected in parallel because make **operation of appliance independent of each other**.
5. When cells are arranged in parallel **the current capacity increases**
6. When no of resistance are connected in parallel, the total current is **less than the smallest resistance**.
7. The smallest resistance obtained by connecting 50 resistances of $\frac{1}{4}$ ohm each is **1/200**
8. Three 2 ohms resistors are connected to form a triangle. The resistance between any two is **4/3 ohm**.
9. A 200 W and 100 W bulb meant for operation at 220 V are connected in series When connected to a 220 V supply, the power consumed by them is **66W**.
10. An electric fan and heater are marked as 100 W, 220 V, and 1000 W, 220 V the resistance of heater is **less than that of fan**.
11. Three cells of emf 1.5 V and identical resistance 1 ohm are connected in parallel. The emf of the combination is **1.5 V**.
12. When the internal resistance of a cell is large compared to the external resistance, then high current is obtained by grouping cells in **parallel**.
13. The emf of a cell depends upon **electrolytes and electrodes of the cells**.
14. Three equal resistances are given. How many combinations from these resistances can be made **four**.
15. Identical wires of nichrome and copper are connected in series in a circuit results in **greater heat in nichrome**.
16. Two identical cells connected in series send 10 A current through 5 ohm resistor. When connected in parallel they send 8 A through the same resistor. The internal resistance of each cell is **2.5 ohms**.

17. n similar resistors each of resistance r when connected in parallel have total resistance R , when connected in series the total resistance is $n^2 R$.
18. Kirchhoff's current law at a junction deals with **conservation of charge**
19. Kirchhoff's voltage law deals with **conservation of energy**.
20. A 50 V battery is connected across 10 ohm resistor. The battery is 4.5 A. The internal resistance of the battery is **1.1 ohm**.
21. Four cells each of internal resistance 1 ohm are connected in parallel. The battery resistance is **0.25 ohm**.
22. An ordinary dry cell can deliver a current of **1/8 A**.
23. In order to get max current in series-parallel grouping of cells the external resistance should be **equal** the total internal resistance of battery.
24. Two equal resistance are connected in series across the supply. If the resistance are now connected in parallel the power produced will be **four times**.
25. When resistance are connected in parallel the current divides itself in inverse **ratio of resistances**.
26. When a dc battery of emf E and internal resistance r deliver max power to an external resistance R , the ratio r/R is **1:1**.
27. Two bulbs rated at 25W, 110V and 100 W, 110V are connected in series to a 220 V supply
the 25W bulb will burn out.
28. A standard 40W tube light is in parallel with the room heater and both are connected to main line. When light is switched off the **output of heater remains same**.

1. An active element in a circuit is one which **supplies energy**.
2. A passive element in a circuit is one which **receives energy**.
3. An electric circuit contains **both active and passive elements**.
4. A linear circuit is one whose parameters (e.g. resistances etc.) **do not change with voltage and current**.
5. In the circuit shown in Fig. 3.22, the number of nodes is **four**.

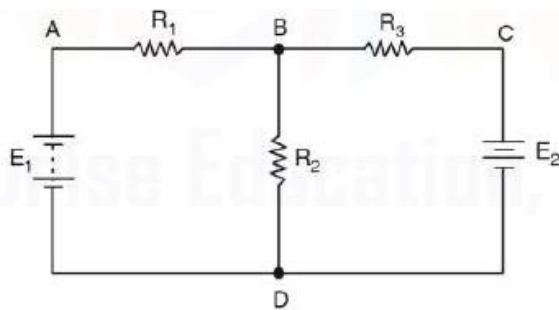


Fig. 3.22

6. In the circuit shown in Fig. 3.22, there are **two** junctions.
7. The circuit shown in Fig. 3.22, has **three** branches.
8. The circuit shown in Fig. 3.22, has **three** loops.
9. In the circuit shown in Fig. 3.22, there are **two** meshes.
10. To solve the circuit shown in Fig. 3.23 by Kirchhoff's laws, we require **two equations**.

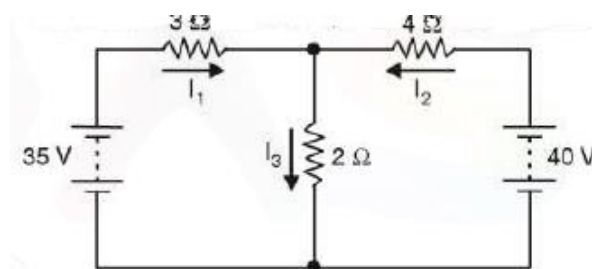


Fig. 3.23

11. To solve the circuit shown in Fig. 3.23 by nodal analysis, we require **one equation**.
12. To solve the circuit shown in Fig. 3.23 by superposition theorem, we require **two circuits**.
13. To solve the circuit shown in Fig. 3.23 by Maxwell's mesh current method, we require **two equations**.

14. In the circuit shown in Fig. 3.24, the voltage at node B w.r.t. D is calculated to be 15V.
The current in 3Ω resistor will be **5A**.
15. The current in 2Ω horizontal resistor in Fig. 3.24 is **2.5A**.

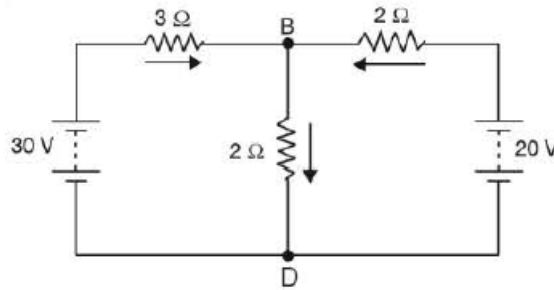


Fig. 3.24

16. In order to solve the circuit shown in Fig. 3.24 by nodal analysis, we require **one equation**.
17. The superposition theorem is used when the circuit contains **a number of voltage sources**.
18. Fig. 3.25 (ii), shows Thevenin's equivalent circuit of Fig. 3.25 (i). The value of Thevenin's voltage E_{Th} is **24V**.

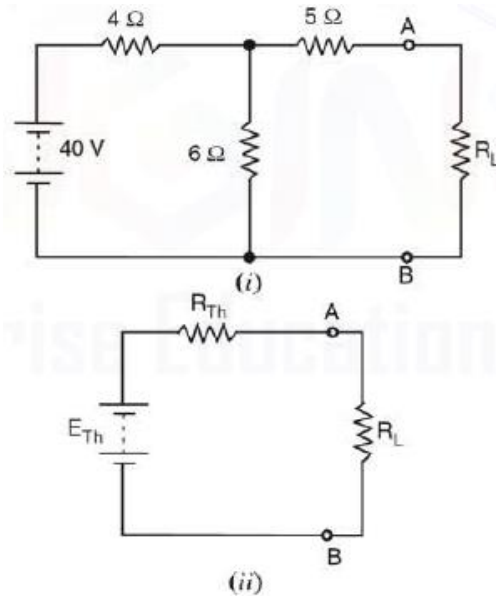


Fig. 3.25

19. The value of R_{Th} in Fig. 3.25 (ii) is **7.4Ω**.
20. The open-circuited voltage at terminals AB in Fig. 3.25 (i) is **24V**.
21. For transfer of maximum power in the circuit shown in Fig. 3.25 (i), the value of R_L should be **7.4Ω**.
22. Fig. 3.26 (ii) shows Norton's equivalent circuit of Fig. 3.26 (i). The value of R_N is **4.5Ω**.

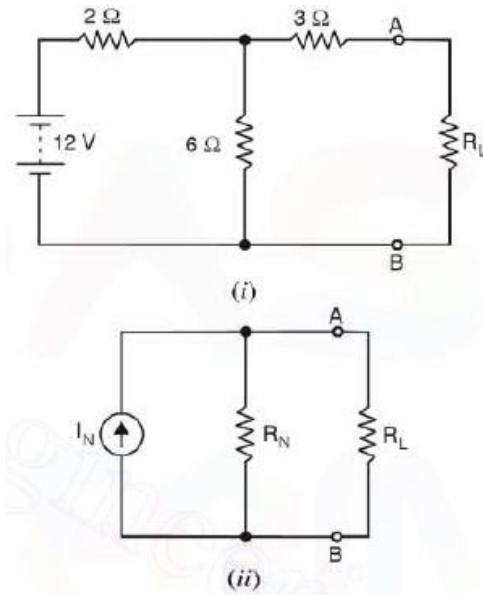


Fig 3.26

- 23. The value of I_N in Fig. 3.26 (ii) is **2A**.
- 24. Thevenin's theorem is **voltage** form of an equivalent circuit.
- 25. Norton's theorem is **converse of** Thevenin's theorem.
- 26. In the analysis of a vacuum tube circuit, we generally use **Thevenin's** theorem.
- 27. Norton's theorem is **current** form of an equivalent circuit.
- 28. In the analysis of a transistor circuit, we usually use **Norton's** theorem.
- 29. Fig. 3.27 (i) shows Norton's equivalent circuit of a network whereas Fig. 3.27 (ii) shows its Thevenin's equivalent circuit. The value of E_{Th} is **6V**.

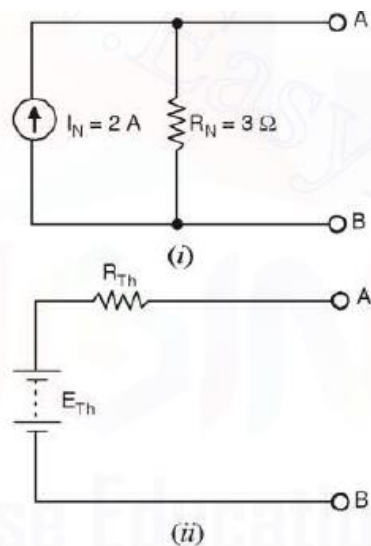


Fig 3.27

- 30. The value of R_{Th} in Fig. 3.27 (ii) is **3Ω**.
- 31. If in Fig. 3.27 (i), the value of I_N is 3A, then value of E_{Th} in Fig. 3.27 (ii) will be **9V**.

32. For transfer of maximum power, the relation between load resistance R_L and internal resistance R_i of the voltage source is $R_L = R_i$
33. Under the conditions of maximum power transfer, the efficiency is **50%**.
34. The open-circuited voltage at the terminals of load R_L is 30V. Under the conditions of maximum power transfer, the load voltage will be **15V**.
35. The maximum power transfer theorem is used in **electronic circuits**.
36. Under the conditions of maximum power transfer, a voltage source is delivering a power of 30W to the load. The power generated by the source is **60W**.
37. For the circuit shown in Fig. 3.28, the power transferred will be maximum when R_L is equal to **6Ω**.

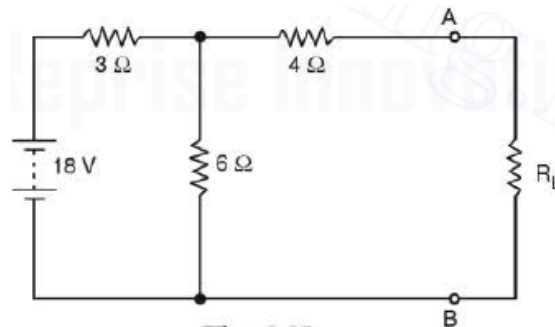


Fig. 3.28

38. The open-circuited voltage at terminals AB in Fig. 3.28 is **12V**.
39. If in Fig. 3.28, the value of $R_L = 6Ω$, then current through R_L is **1A**.
40. Under the conditions of maximum power transfer, the voltage across R_L in Fig. 3.28 is **6V**.
41. The output resistance of a voltage source is $4Ω$. Its internal resistance will be **4Ω**.
42. Delta/Star or star/delta transformation technique is applied to **three terminal** network.
43. The resistor values in delta network that is equivalent to a Wye containing three $120Ω$ resistors is **360Ω each**.
44. The resistor values in Wye network that is equivalent to a delta containing three $12kΩ$ resistors is **4kΩ each**.
45. When a load of $1kΩ$ is connected across a $20mA$ current source, it is found that only $18mA$ flows in the load. The internal resistance of the source is **9kΩ**.

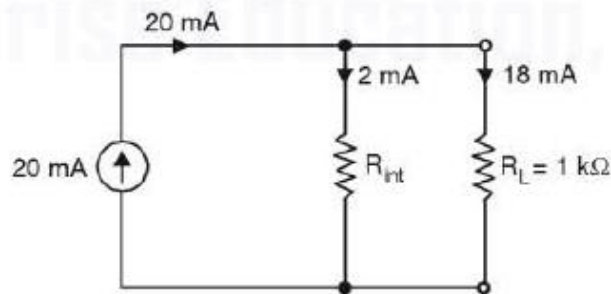


Fig. 3.29

46. The terminal voltage of the current source (with R_L connected) in Fig. 3.29 will be **12V**, if the internal resistance of the source were $1.5kΩ$.

47. The current in $3\text{k}\Omega$ resistor in Fig. 3.30 by converting the current source into voltage source is **10mA** .

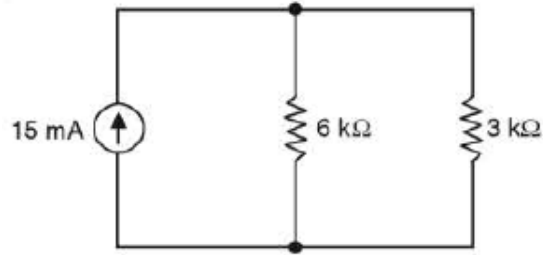


Fig. 3.30

48. Using mesh analysis, the current in 4Ω resistor in Fig. 3.31 is **3A downward**.

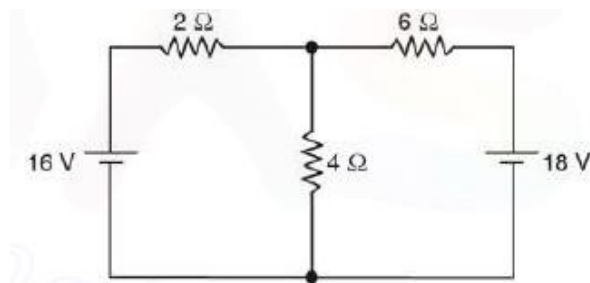


Fig. 3.31

49. Using mesh analysis, the current in 6Ω resistor in Fig. 3.32 is **0.64A \uparrow** .

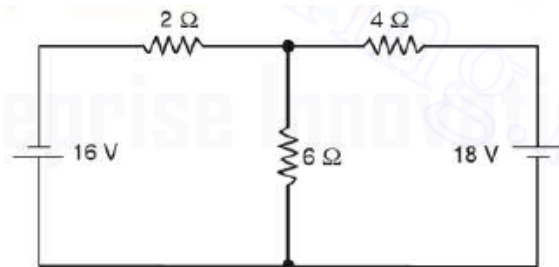


Fig. 3.32

50. A voltage source has a terminal voltage of 28V when its terminals are open-circuited. When a 12Ω load is connected across the terminals, the terminal voltage drops to 24V . The internal resistance of the source will be **2Ω** .
51. A 16mA current source has an internal resistance of $10\text{k}\Omega$. **12.8mA** current will flow in a $2.5\text{k}\Omega$ load connected across the terminals.
52. Converted voltage source shown in Fig. 3.33 to an equivalent current source will be **2.4A in parallel with 2.5Ω resistor**.

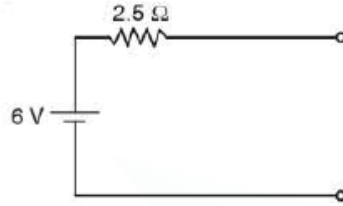


Fig 3.33

53. In figure 3.33 above, **2.4A** is the shorted terminal current in the equivalent current source.
 54. Converted current source shown in Fig. 3.34 to an equivalent voltage source will be **40V** in series with **25KΩ**.

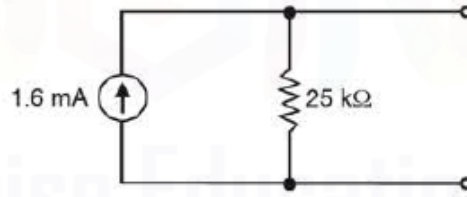


Fig 3.34

55. By performing an appropriate source conversion, the voltage across 120Ω resistor in Fig. 3.35 will be **20V**.

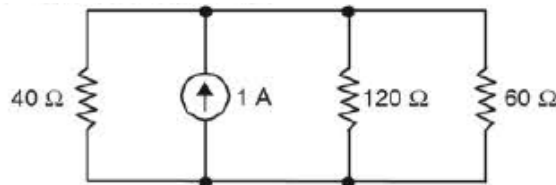


Fig 3.35

56. By performing an appropriate source conversion, the voltage across 120Ω resistor in Fig. 3.36 will be **30V**.

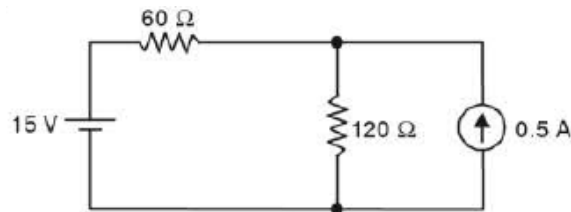


Fig 3.36

57. Converted voltage source shown in Fig. 3.37 to an equivalent current source will be **9mA** in parallel with **2KΩ**.

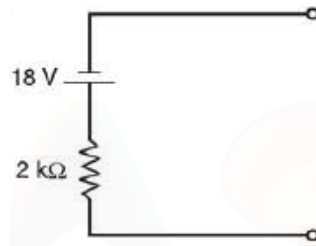


Fig. 3.37

58. In the above question, **9mA** is the shorted terminal current in the equivalent current source.
59. Using nodal analysis, **-75V** is the voltage at point A [See Fig. 3.38].

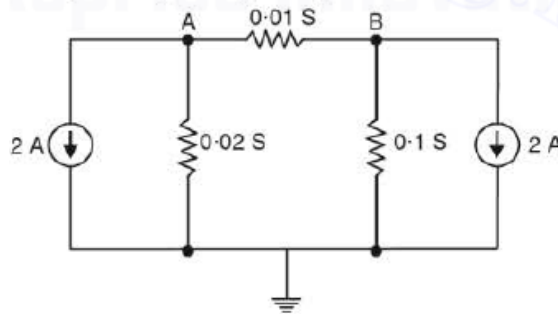


Fig. 3.38

60. In Fig. 3.38, **-25V** is the potential at point B by nodal analysis.
61. Using superposition theorem, current in 10Ω resistor in Fig. 3.39 is **about 500mA** ↓.

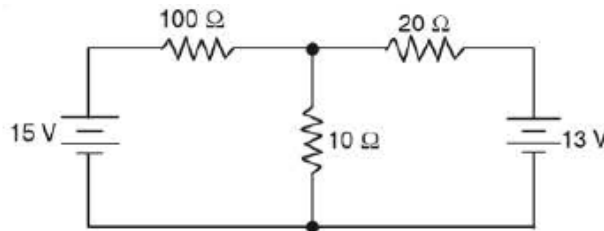


Fig. 3.39

62. **2.5W** is the power dissipated in 10Ω resistor in Fig. 3.39 above.
63. $E_{Th} = 4V$, $R_{Th} = 6.67\Omega$ is the Thevenin equivalent circuit to the left of terminals A and B in Fig. 3.40

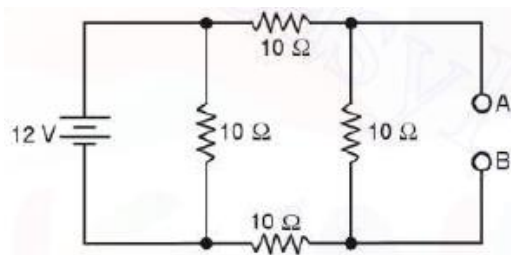


Fig. 3.40

64. $E_{Th} = 16V$, $R_{Th} = 140\Omega$ is the thevenin equivalent circuit to the left of terminals x-y in Fig. 3.41

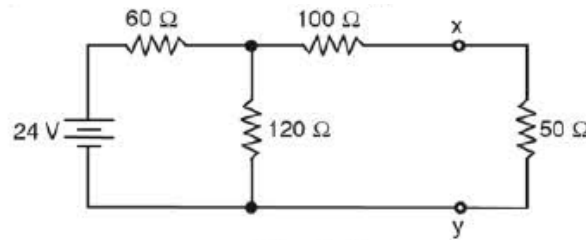


Fig. 3.41

65. $E_{Th} = 15V$, $R_{Th} = 10K\Omega$ is the Thevenin equivalent circuit lying to the right of terminals x-y in Fig. 3.42

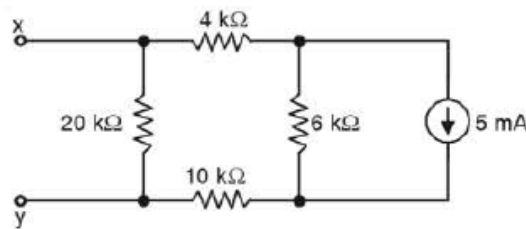


Fig. 3.42

66. 9V, 12V is the voltage across R_L in Fig. 3.43 when $R_L = 1K\Omega$ and $2K\Omega$.

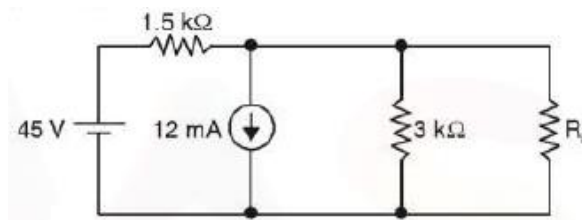


Fig. 3.43

67. $I_N = 3.3A$, $R_N = 6.67\Omega$ is the Norton equivalent current source at terminals x-y in Fig. 3.44

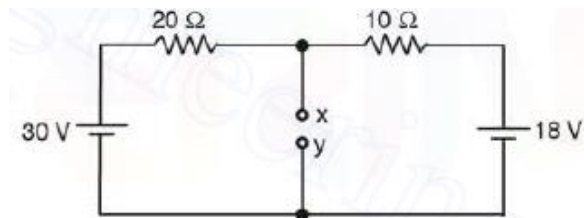


Fig. 3.44

68. $I_N = 0.01A$ is the Norton equivalent current to the left of terminals of x-y in Fig. 3.45

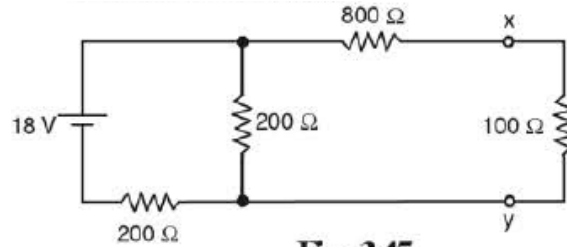


Fig. 3.45

69. The ammeter labelled A in Fig. 3.46 reads 35mA. Is 2.2kΩ resistor shorted? (Yes). Assume ammeter has negligible resistance.

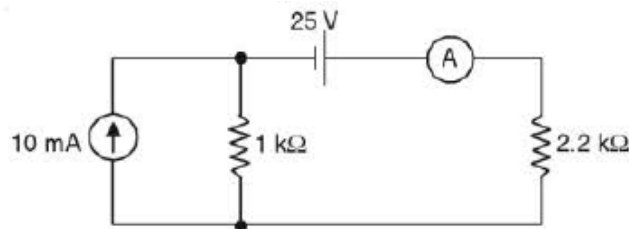


Fig. 3.46

70. In Fig. 3.46, **10.94mA** should be the ammeter reading if 2.2KΩ resistor is not shorted.
 71. **150Ω** is the value of R_L in Fig. 3.47 to obtain maximum power in R_L .

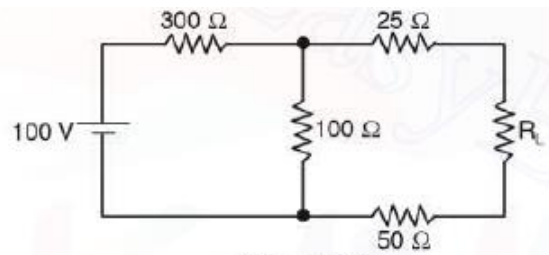


Fig. 3.47

72. In Fig. 3.47, **1.042W** is the maximum power in R_L .
 73. **88.89%** of P_L (max) of the maximum power is delivered to R_L in Fig. 3.48 when

$$R_L = 2R_{TH}$$

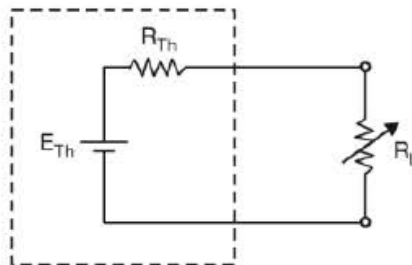


Fig. 3.48

74. **88.89%** of the maximum power is delivered to R_L in Fig. 3.48 when $R_L = R_{Th}/2$.

75. Single current source of 0.1A and resistance 75Ω is the Millman's equivalent circuit w.r.t. terminals x-y in Fig. 3.49.

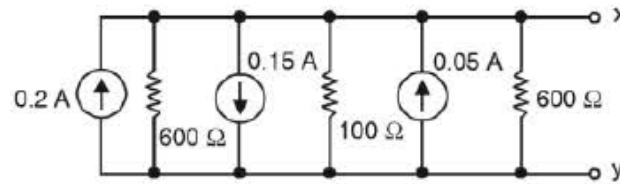


Fig 3.49

76. Use superposition principle to find current through R_1 in Fig. 3.50 is 2mA ←.

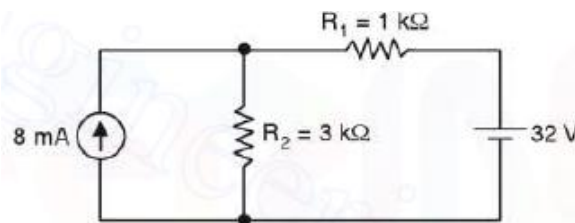


Fig 3.50

77. Use superposition principle to find current through R_1 in the circuit shown in Fig. 3.51 is 0.125A →.

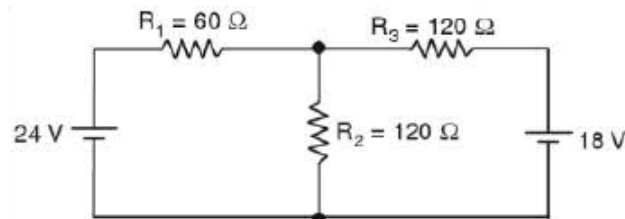


Fig 3.51

78. $E_{Th} = 10\text{V}$; $R_{Th} = 9\Omega$ is the thevenin equivalent circuit to the left of terminals x-y in Fig. 3.52.

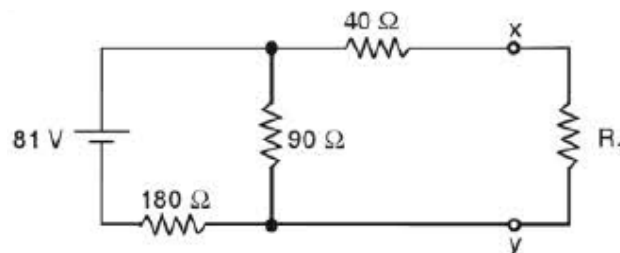
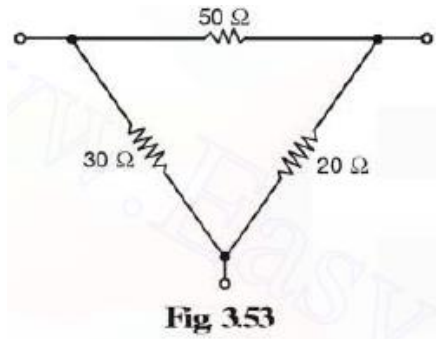
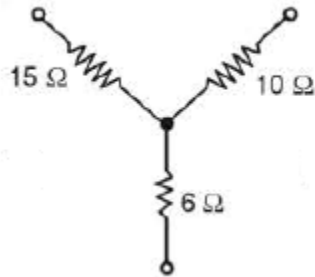


Fig 3.52

79. Convert delta network shown in Fig. 3.53 to equivalent Wye network



Ans:



80. **33.06%** of the maximum power is delivered to a load if load resistance is 10 times greater than the Thevenin resistance of the source to which it is connected.

Electrical Work, Power And Energy Chapter # 04 (VK Mehta)

1. A kilowatt hour is unit of **Energy**.
2. Heat produced in a conductor depends **directly on time**.
3. If the potential difference across a conductor of a material of resistivity ρ is constant, then heat produced in a conductor is proportional to $\frac{1}{\rho}$.
4. One kilowatt hour is equal to **36×10^5**
5. The heater element in iron is made of **Nichrome**.
6. The heat produced (in k Cals) in a resistance R ohm when a current I amperes flows through it for t seconds is given by $\frac{I^2 R t}{4.2 \times 10^3}$.
7. Three electric bulbs 40 W, 60 W and 100 W are designed to work on a 220 V mains. Which bulb will burn most brightly if they are connected in series across 220V mains? **40 W** .
8. Two electric bulbs have tungsten filament of the same length. If one of them gives 60 W and the other 100 W, then **100 W bulb has thicker filament**.
9. Two electric lamps of 40 W each are connected in parallel. The power consumed by the combination is **80 W**.
10. The time required for 1kW heater to raise the temperature of 10 liters of water through 10°C is **420 sec**.
11. Two electric lamps 40 W, 220 V each are connected in series across 220 V. The power consumed by the combination is **20 W**.
12. Two bulbs, 100 W, 250 V and 200 W, 250 V, are connected in parallel across a 500 V line then **both bulbs will be fused**.
13. Two bulbs 100 W, 250 V and 200 W, 250 V are connected in series to a 500 V line, Then **100 W bulb will be fused**.
14. Three bulbs B_1, B_2 and B_3 are connected to the mains as shown in fig 4.5. If B_3 is disconnected from the circuit by opening switch S , then incandescence of bulb B_1 will **decrease**.

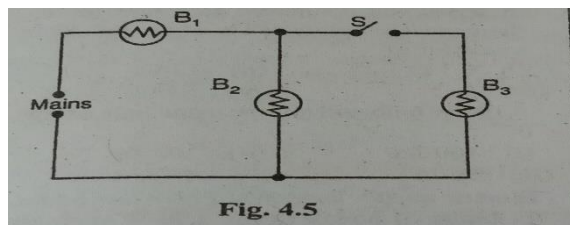
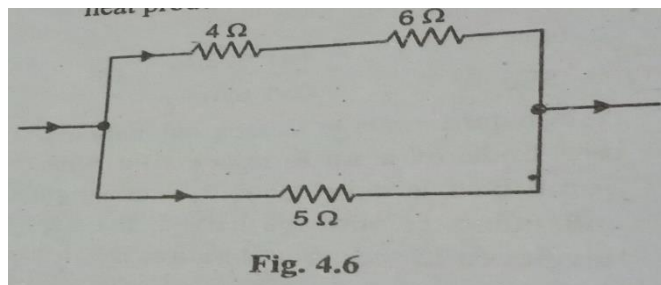


Fig. 4.5

15. 1 kW, 250 V electric heater, 1 kW, 250 V electric kettle and 1 kW, 250 V bulb **all have equal resistance**.
16. If current in an electric bulb drops by 2% then power in decrease by **4%**.
17. Two bulbs of 500 W and 300 W are manufactured to operate on 220V line. The ratio of resistance of 500 W bulb to that of 300 W bulb is **3:5**
18. The mass of copper drawn into two wires 1 mm thick and 3mm thick. Two wires are connected in series and current is passed . Heat produced in the wires is in the ratio **81:1**

19. The power of heater is 500 W at 800°C. What will be its power at 200°C? Temperature coefficient of resistance is $4 \times 10^{-4} / ^\circ\text{C}$. **.620W.**
20. A constant voltage is applied b/w two ends of uniform metallic wire some heat is developed. If both length and radius of wire are halved, the heat developed in the same direction is **half.**
21. The heat produced in a conductor of resistance 4.2Ω with 10 A flowing in it is **42cal/sec.**
22. A heater coil rated at 1000 W, 220V is connected to 110 V line. Power consumed is **250 W**
23. Two electric bulbs marked 500 W; 220 V are put in series with 110V line. The power dissipated in each bulb is $\frac{125}{4}$ W
24. An electric fan and heater are marked as 100 W, 220 V and 1000 W, 220V respectively. The resistance of heater is **less than that of fan.**
25. Two resistor connected in parallel across a cell of negligible internal resistance , use four times the power that they would use, when in series across the same cell. If one the resistance is 10Ω , The resistance of the other is **10Ω .**
26. In the circuit shown in fig 4.6 the heat produced in 5Ω resistor is 10 Cal/sec. The heat produced in 4Ω resistor will be **2 Cal/sec**



27. How much energy in kilowatt hour is consumed in operating ten 50 W bulbs for 10 hours per day in the month of June. **150 W**
28. The water in an electric kettle begins to boil in 15 minutes after being switched on. Using the same main supply, should the length of wire used as heating element be increased or decreased if water is to be boiled in 10 minutes? **Decreased.**
29. A constant voltage is applied b/w the two ends of a metallic wire of uniform area of cross section . Some heat is developed . The heat is doubled if **both the radius and length are doubled.**
30. A uniform wire when connected directly across a 200 V line produces heat H per second. If the wire is divided into n equal parts all parts are connected in parallel across 200 V line, the heat produced per second is **n^2H .**
31. Three equal resistors in series across a source of emf together dissipate 10 W of power. If the same resistors are connected in parallel across the same emf the power dissipate will be **90 W.**
32. Two flash light electric incandescent lamps require 30 A each at 1.5 V. If they are placed in series and connected to 6 V source, there must be connected in series with them a resistor of **0.1Ω .**

33. A 100 W bulb will give heat and light energy of **100 J/s**
34. Electric supply is rated at 200 V. In a house, 11 bulbs of power rating 100 W each are used. The rating of fuse should be **4 A**.
35. **length** is immaterial for fuse.
36. By what percentage will the incandescence of a lamp decrease if the current drops by 2%. **4%**.
37. Appliances based on heating effect of current work on **both d.c and a.c**.
38. Two coils connected in parallel across 100 V supply take 10 A from the line. The power dissipated in one coil is 600 W. The resistance of the other is **25 Ω** .
39. A 3 $^{\circ}\text{C}$ rise of temperature is observed in a conductor by passing a certain amount of current. If current through the conductor is doubled, the rise of temperature will be **12 $^{\circ}\text{C}$** .
40. A house is served by a 220 V line. In a circuit protected by a fuse marked 9 A, the maximum number of 60 W lamps in parallel that can be turned on is **33**.
41. A fuse wire is made up of **lead-tin alloy**.
42. A resistor R_1 dissipated the power P when connected to a certain generator. If a resistance R_2 is put in series with R_1 , then power dissipated by R_1 **decrease**.
43. How many calories of heat will approximately be developed in 210 W electric bulb in 5 minutes? **15000 W**.
44. A tap supplies water at 22 $^{\circ}\text{C}$. A man takes 1 liter of water per minute at 37 $^{\circ}\text{C}$ from the geyser. The power of geyser is **1050 W**.
45. Fuse is a wire of **high resistance and low melting point**.
46. Lamps used for house lighting are connected in **parallel**.
47. Two heat lamps of a car in parallel. They together consumed 48 W with the help of a 6 V battery. The resistance of each bulb is **1.5 Ω** .
48. Three identical resistance A, B and C are connected to a battery as shown in fig 4.7. The heat produced is **maximum in A**.

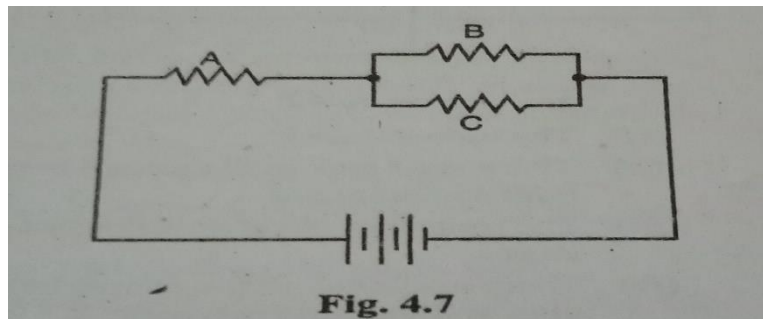
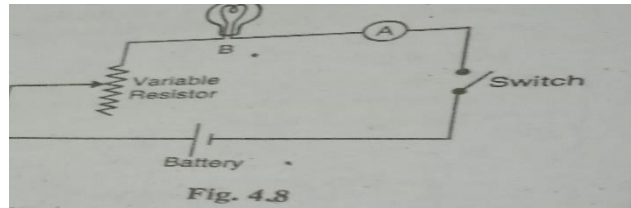


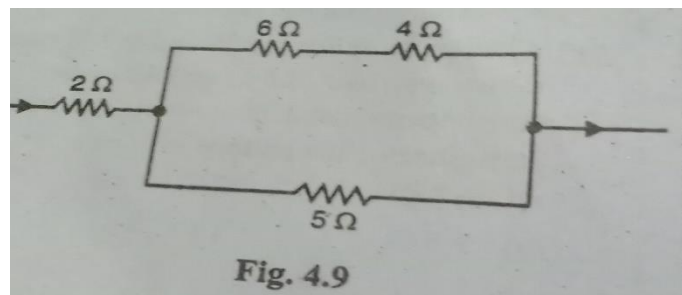
Fig. 4.7

49. Two electric bulbs whose resistance are in the ratio 1:2 is connected in parallel to a constant voltage source. The powers dissipated by them are in the ratio **2:1**.
50. A 40 W tube light is in parallel with a room heater on a main line. What happens when light is switched off. **The heater output remains the same**.
51. A battery supplies 150 W and 196 W power to two resistors of 6 Ω and 4 Ω when they are connected separately to it. The internal resistance of the battery is **1 Ω** .

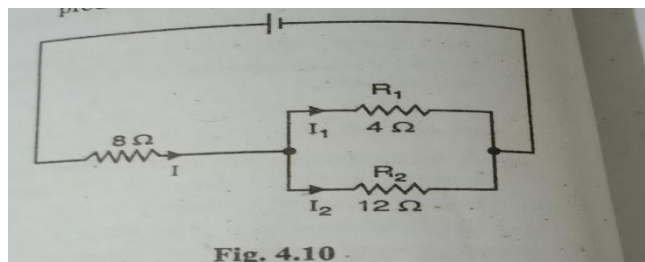
52. In the circuit of fig 4.8. the bulb B does not light although ammeter A indicates that current is flowing. Why does the bulb not light? The switch is in closed position. **The resistance of variable resistor is too large.**



53. Two identical heaters, each marked 1000 W, 250 V are placed in series and then connected to a 250 V supply. Their combined rate of heating is **2000 W**.
54. An electric kettle boils 1 kg of water in time t_1 and another kettle boils the same amount of water in time t_2 . When they are joined in series, the time t required to boil 1 kg of water is **t_1+t_2** .
55. In the circuit shown in fig 4.9, the 5Ω resistor develops heat at the rate of 13.5 Cal/sec. The heat developed per second in 2Ω resistor is **9.6 Cal**.

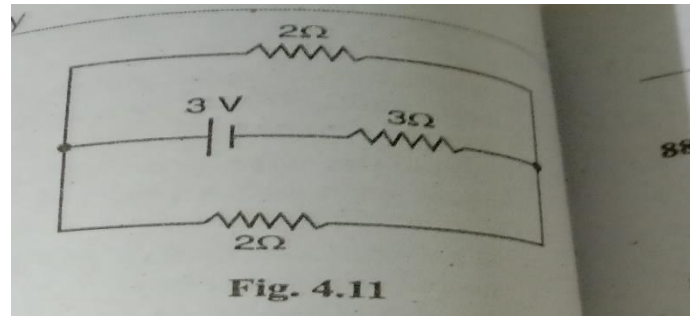


56. A voltage drop of 10 V develops across a $1\text{ k}\Omega$ resistor. The power dissipated in the resistor is **0.1 W**.
57. A 24 V battery of internal resistance $4\ \Omega$ is connected to a variable resistor. At what value of current drawn from the battery is the heat produced in the resistor maximum? **3 A**.
58. A cell sends current through a resistance R_1 for time t . Next the same cell sends current through another resistance R_2 for the same time t . If the same heat is developed in both the cases, then internal resistance of the cell is **$\sqrt{R_1 R_2}$** .
59. In the circuit shown in fig 4.10, the cell has an internal resistance of $1\ \Omega$. The heat produced in $8\ \Omega$ coil is 32 Cal/sec. The heat produced in one second in $4\ \Omega$ coil is **9 Cal**.



60. You are given resistance wire of length 50 cm and a battery of negligible internal resistance. In which case the maximum amount of heat is generated? **When the wire is divided into four equal parts and all the four parts are connected in parallel across the battery.**
61. Two electrical appliances are connected in parallel to a constant voltage supply. If current in one appliances is less than the second appliances by 1%, then power of the first appliances will be less by **1%**.
62. If R_1 and R_2 are respectively the filament resistance of 200 W bulb and 100 W bulb designed to operate at the same voltage then, **$R_2=2R_1$.**
63. A generator produces 100 kW of power at a potential difference of 10 kV. The power is transmitted through cables of total resistance 5Ω . What is power loss in cables? **500 W.**
64. A constant voltage is applied across the ends of a conductor. The heat produced is **inversely proportional to length.**
65. An electric kettle of 2000 W contains 1 kg of water at 20°C . Calculate the time required to heat water to its boiling point. The water equivalent of kettle is 0.5 kg and $J= 4.2$ joules/Cal. **4.2 sec.**
66. Atomic power station of tarapore has a generating capacity of 200 MW. The energy generated in a day by this station is **$1728\times 10^{10}\text{J}$.**
67. A resistance coil of 60Ω is immersed in 42 kg of water. What is the rise of temperature of water per minute if a steady current of 7A is made to flow through the coil? **10°C .**
68. An immersion heater is rated 418 W. It should heat a liter of water from 10°C to 30°C in nearly **200 s.**
69. Two bulbs of equal wattage, one having carbon filament and the other having tungsten filament, are connected in series to the mains, then **carbon filament glows more.**
70. Two wires A and B with lengths in the ratio of 3:1, diameters in the ratio of 1:2 with specific resistance in the ratio of 1:20 are joined in parallel across a cell of e.m.f 2V and negligible internal resistance. The ratio of rates of heat production (H_A/H_B) is **5:3.**
71. Of the two bulbs in a house , one glows brighter than the other. Which of the two has a larger resistance? **The dim bulb.**
72. A d.c supply voltage has an internal resistance of r ohm. A resistive load R is connected across the terminals of the supply. The power developed in R is maximum when the value of R is **r ohm.**
73. Two identical heater coils are connected in parallel across the mains. If one of the coil breaks, the other coil develops **same temperature as before.**
74. The power rating of a motor drawing a current of 40 A to 400 V is **16000 W**
75. The current in a 960 W, 240 V heater operated at 200V is **$10/3$ A.**
76. One heater coil boils certain amount of water in 10 minutes and another heater coil in 15 minutes. In how much time the same water will be boiled if the two heaters are put in series? **25 min.**
77. In the above problem, in how much time the same amount of water will be boiled if the two heaters are put in parallel. **6 min.**
78. Two lamps of 100 W and 200 W rated for 220V are placed in series and a 440 V applied across them. Then **only 100 W will fuse.**

79. A coil of wire of resistance 50Ω is embedded in a block of ice. What is the amount of ice melted in 1 s if a potential difference of 210 V is applied across the coil? **2.625g.**
80. In the circuit shown in fig 4.11 , the battery has negligible internal resistance. The power supplied by the battery is **$9/4$ W.**



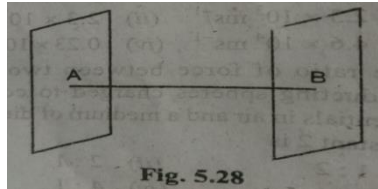
81. When a certain motor is operated for 30 minutes, it consumes 0.75 kWh of energy. During that time, its total energy loss is 3×10^5 J. How many joules of work does it perform in 30 minutes? **24×10^5 J.**
82. The total power supplied to an engine that drives an electric generator is 40.25 kW. The generator delivers 15 A to a load of 100Ω . The efficiency of the system is **0.559.**
83. A certain motor draws 17 A from a 240 V source. If the motor is 91.5% efficient, the horsepower rating of the motor is **5 h.p.**
84. A certain amplifier develops 80 W of output power. A d.c power supply furnishes the amplifier 3 A at 40 V. The power supply draws 1.6 A from 120 V source. The efficiency of the amplifier is **0.666.**
85. In Q 84, the efficiency of power supply is **0.625.**
86. In Q 84, the overall efficiency is **0.416.**
87. What maximum voltage can be connected across a 0.5 W, 270Ω resistor without exceeding the rated power dissipation? **11.62 V.**
88. What is the maximum safe current flow in a 47Ω , 2 W resistor? **0.21 A.**
89. How long would it take $0.5 \text{ M}\Omega$ of resistance to dissipate 1000 joules of heat if the current in the resistance is $20 \mu\text{A}$? **5×10^6 s.**
90. Two resistors of resistance 8Ω and 12Ω are connected in parallel. The power dissipated in 12Ω resistor is **6 W.**
91. A coil develops heat of 800 Cals/sec. When 20 V is applied across it. The resistance of the coil ($1 \text{ Cal}=4.2\text{J}$) is **0.12Ω .**
92. An electric motor operating at 100 V d.c draws current of 10 A. The resistance of the windings of the motor if its efficiency is 25 % is **7.5Ω .**
93. An electric kettle working at 220 V heats up 2 liters of water from 20°C to 100°C in 2 minutes. The current drawn by the kettle is **25.45 A.**
94. A 500 W heater is designed to operate on a 220 V line. If the line voltage drops to 200 V, the percentage drop in the heat output is **17.36%.**
95. A 5°C rise in temperature is observed in a conductor by passing a current. When the current is doubled, the rise in temperature will be **20°C .**

Chapter No.5

1. The force between two electrons separated by a distance r varies as r^2 .
2. Two charges are placed at a certain distance apart. A brass sheet is placed between them. The force between them will **decrease**.
3. Which of the following appliance will be studied under electrostatics? **Lightning rod**.
4. The relative permittivity of air is **1**.
5. The relative permittivity of a material is 10. Its absolute permittivity will be **$8.854 \times 10^{-11} \text{ F/m}$** .
6. Another name for relative permittivity is **dielectric constant**.
7. The relative permittivity of most materials lies between **1 and 10**.
8. When the relative permittivity of the medium is increased, the force between two charges placed a given distance apart **decreases**.
9. Two charges placed at a distance apart. If a glass bulb is placed between them, the force between the charges will **decrease**.
10. There are two charges of $+1 \mu\text{C}$ and $+5 \mu\text{C}$. The ratio of the forces acting on them will be **1:1**.
11. A soap bubble is given a negative charge. Its radius **increases**.
12. The ratio of force between two small spheres with constant charge in air and in a medium of relative permittivity K is **K:1**.
13. An electric field can deflect **α -particles**.
14. Electric lines of force enter or leave a charged surface at an angle of **90°** .
15. The relation between absolute permittivity of vacuum (ϵ_0), absolute permittivity of vacuum (μ_0), and velocity of light (c) in vacuum is
$$c^2 = \frac{1}{\mu_0 \epsilon_0}$$
16. As one penetrates a uniformly charged sphere, the electric field strength E is **zero at all points**.
17. If the relative permittivity of the medium increases, the electric intensity at a point due to a given charge **decreases**.
18. Electric lines of force about negative point charge are **radial, inward**.
19. A hollow sphere of charge does not produce an electric field at any **interior point**.
20. Two charged spheres of radii 10 cm and 15 cm are connected by a thin wire. No current will flow if they have **the same potential**.
21. Electric potential is a **scalar quantity**.
22. A charge Q_1 exerts some force on a second charge Q_2 . A third charge Q_3 is brought near. The force of Q_1 exerted on Q_2 **remains unchanged**.
23. The potential at a point due to a charge is 9 V. if the distance is increased three times, the potential at that point will be **3 V**.
24. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. the potential at the center of sphere is **10 V**.
25. If a unit charge is taken from one point to another over an equipotential surface, **then no work is done**.
26. The electric field intensity on the surface of a charged conductor **directed normal to the surface**.
27. The force between two charges separated by a distance d in air is 10 N. when the charges re placed same distance apart in a medium of dielectric constant ϵ_r , the force between them is 2 N. What is the value of ϵ_r ? **$\epsilon_r = 5$** .

28. Two small spheres, each carrying a charge Q , placed d meters apart repel each other with a force F . If one of the spheres is taken around the other one in a circular path of radius r , the work done will be **zero**.
29. The electric potential across part AB of a circuit is 2 V; point A being at higher potential. If a charge 2 C moves from A to B, the energy released is **4 joules**.
30. Out of the materials given below, which has the highest dielectric strength? **Glass**.
31. Two equal and similar charges are placed a finite distance apart. A third equal and dis-similar charge is placed midway between them. The third charge will be **in unstable equilibrium**.
32. The positive terminal of a 12 V battery is earthed. The negative terminal will be at **-12 V**.
33. A tiny particle carrying charge of 0.3 C is accelerated through a potential difference of 1000 V. the kinetic energy acquired by particle is **300 J**.
34. Two charges $+3 \mu\text{C}$ and $-12 \mu\text{C}$ are separated by a distance of 0.4 m. Where should a third charge of $+3 \mu\text{C}$ be placed from $+3 \mu\text{C}$ so that it experiences a zero force? 0.4 m.
35. For a dipole, electric field varies as r^{-3} .
36. An electric dipole when placed in a uniform electric field E will have minimum potential energy if the dipole makes the following angle with E . **Zero**.
37. When a charge is brought from infinity along the perpendicular bisector of a dipole, the work done is **zero**.
38. A hollow insulated conducting sphere is given a positive charge of $10 \mu\text{C}$. What will be the electric field at the center of sphere if its radius is 2 m? **Zero**.
39. The electric potential at the surface of an atom nucleus ($Z=50$) of radius 9.0×10^{-15} m is **8×10^6 V**.
40. The insulation property of air breaks down at $E=3 \times 10^6$ V/m. the maximum charge that can be given to a sphere of diameter 5 m is approximately **2×10^{-3} C**.
41. An α particle is accelerated through a potential difference of 10 4 V. The gain in kinetic energy of the α particle is **2×10^4 eV**.
42. If a charge is moved against the coulomb force of an electric field, then, **energy is used by some outside source**.
43. Electrons are caused to fall through a potential difference of 1500 V. if they were initially at rest, their final speed is **2.3×10^7 ms⁻¹**.
44. The ratio of force between two small conducting spheres charged to constant potential in air and a medium of dielectric constant 2 is **1:2**.
45. Proton has a mass of 1840 times that of an electron. If a proton is accelerated from rest by a p.d. of 1 V, its kinetic energy is **1 eV**.
46. A cloud is at a potential of 8×10^6 V relative to the ground. A charge of 40 C is transferred in lightning stroke between the cloud and the ground. The energy dissipated is **3.2×10^8 J**.
47. Two free protons are separated by a distance 1 \AA . If they are released, the kinetic energy of each proton when at infinite separation is **11.5×10^{-19} J**.
48. A uniform wire of length 5 m is carrying a steady current. The electric field inside it is 0.2 N/C. The potential difference across the ends of the wire is **1 V**.
49. Two parallel metal plates maintained at a potential difference of 1000 V are separated by 0.2 m. An electron is placed between the two plates. The force experienced by the electron is **8×10^{-15} N**.

50. Fig. 5.28 shows two equipotential surfaces A and B kept at a small distance r from each other. A point charge $-q$ coulomb is taken from the surface A to B. the amount of net work done will be **zero**.

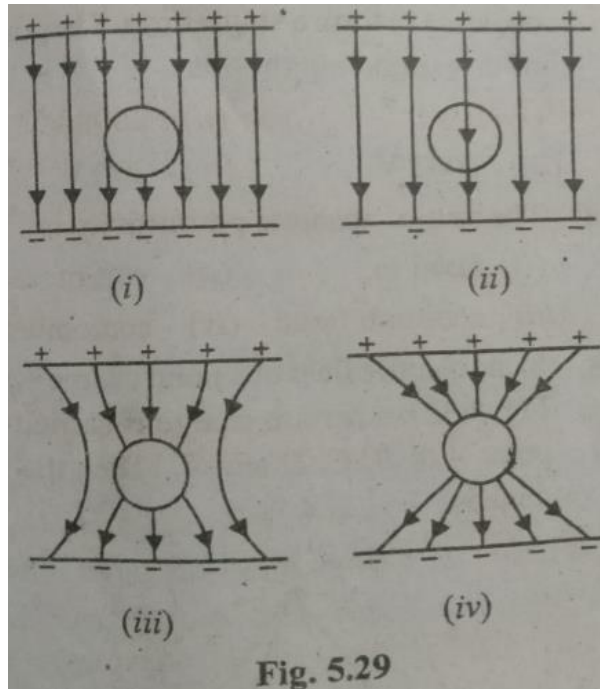


51. An electric dipole is placed in a uniform electric field at an angle Θ . For what value of Θ , the potential energy of the dipole is maximum? **π** .
52. An oil drop carries 6 electronic charges and falls with a terminal velocity in air. What magnitude of vertical electric field is required to make the drop to move upward with the same speed as it was formerly moving downward? Mass of oil drop = 1.6×10^{-15} kg. **32.7 kNC^{-1}**
53. If a force exerted by a small spherical charged body on another object at 8 cm is 2 N, what will be the force exerted when the second object is moved to 4 cm? **8 N**.
54. Two plates are 1 cm apart and the potential difference between them is 10 V. the electric field between the plates is **1000 N/C**.
55. The relative permittivity of an insulator cannot be **infinity**.
56. An electric dipole placed in a uniform electric field is in stable equilibrium. The angle between the electric dipole moment and the electric field is **0°** .
57. The dielectric used in high voltage transformers is **porcelain**.
58. The electric potential at a point in air due to a point charge is 9 V. If air is replaced by a medium of relative permittivity 3, then electric potential at that point will be **3 V**.
59. The electric flux density is a **vector quantity**.
60. Three charges of + 3 C, -4 C and + 6 C are placed inside a sphere. The total electric flux passing through the surface of sphere is **5 C**.
61. If the relative permittivity of the medium increases, the electric intensity at a point due to given charge **decreases**.
62. As one penetrates a uniformly charged sphere, the electric field strength is **zero at all points inside the sphere**.
63. Two charges $4 \mu\text{C}$ and 7 mC are placed 4.5 cm apart. What is the electric potential energy of the system? **$5.6 \times 10^3 \text{ J}$** .
64. An electric dipole in a non-uniform electric field. It experiences **a force and a torque**.
65. Two point charges are placed on x-axis. A $2 \mu\text{C}$ charge is at $x = 10 \text{ cm}$ and $-1 \mu\text{C}$ charge is at $x = 40 \text{ cm}$. What is the potential at $x = 100 \text{ cm}$ from the origin? **5000 V**.
66. Three charges each of + 2 C are placed at the three corners of an equilateral triangle. If the force between any two charges is F , then net force on any charge is: **$\sqrt{3} F$** .
67. Electric lines of force about a negative point charge are **radial inward**.
68. Three small sized insulated sphere each carrying a charge $+q$ are placed at three points on the circumference of a circle so as to form an equilateral triangle. If R is the radius of the circle, what will be the force on charge $+Q$ placed at the center of the circle? **Zero**.
69. Two charged conducting spheres have radii r_1 and r_2 . The ratio of their charge densities if their potentials are same is **r_2/r_1** .

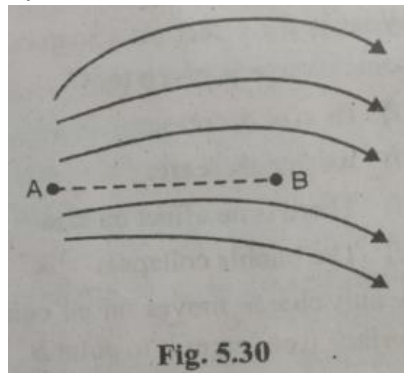
70. A charge of $6.75 \mu\text{C}$ in an electric field acted upon by a force of 2.5 N . The potential gradient at that point is **$3.71 \times 10^5 \text{ V/m}$** .
71. The potential at a certain point from a point charge is 600 V and the electric field is 200 NC^{-1} . The distance of the point of observation from the point charge is **3 m** .
72. In the above question, the magnitude of point charge is **$2 \times 10^{-7} \text{ C}$** .
73. n drops each of radius r and carrying charge q are combined to form a bigger drop of radius R . What is the ratio of potentials of bigger to that of the smaller? $n^{2/3} : 1$.
74. A hollow metallic sphere of radius 0.1 m is given a charge of $10 \mu\text{C}$. The potential on the surface of sphere is **$9 \times 10^5 \text{ V}$** .
75. A charge of $3.2 \times 10^{-19} \text{ C}$ is placed in a uniform electric field of 100 V/m and moves a distance of 0.2 m parallel to and in the direction of field. The energy transformed is **$6.4 \times 10^{-18} \text{ J}$** .
76. The magnitude of electric field that will balance the weight of α particle will be **$2 \times 10^7 \text{ N/C}$** .
77. An electron is accelerated through a potential difference of 12000 V . Its initial velocity is 10^{-7} m/s . The final velocity of the electron will be **0.215 m/s** .
78. A spherical drop of radius 10^{-6} m has absorbed 40 electrons. The energy required to give an additional electron to it is **$9.21 \times 10^{-21} \text{ J}$** .
79. If an electron experiences a force equal to its weight when placed in an electric field, then intensity of the field will be **$5.6 \times 10^{-11} \text{ N/C}$** .
80. Eight identical drops of a liquid each charged to potential of 100 V when they are far apart, are mutually brought together and formed into a single drop. What is the potential of the single drop? **400 V** .
81. In an electron gun, the accelerating potential is V volts. If e is the charge and m is the mass of an electron, the maximum velocity attained by electron is

$$\sqrt{\frac{2eV}{m}}$$

82. Two thin concentric hollow conducting spheres of radii R_1 and R_2 bear charges Q_1 and Q_2 respectively. If $R_1 > R_2$, then potential at a point distant r such that $R_1 > r > R_2$ is
- $$\frac{1}{4\pi\epsilon_0} \left[\frac{Q_1}{R_1} + \frac{Q_2}{r} \right]$$
83. In the above question, electric field intensity at $R_1 > r > R_2$ is
- $$\frac{1}{4\pi\epsilon_0} \left[\frac{Q_2}{r^2} \right]$$
84. In the direction of electric field intensity, the electric potential **decrease**.
85. The relative permittivity of a dielectric can be **4**.
86. An electron is moved towards another electron. What is the effect on the electrostatic potential energy of the system? **P.E. increases**.
87. An electron has a charge of $1.6 \times 10^{-19} \text{ C}$ when at rest. When it moves with a speed of $0.8c$ (c being speed of light), the charge on electron will be $1.6 \times 10^{-19} \text{ C}$.
88. In a hydrogen atom, the electron revolves around the proton in an orbit of 0.53 \AA . The potential produced by the electron on the nucleus is **27.2 V** .
89. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force look like (See Fig. 5.29) **(iii)**.



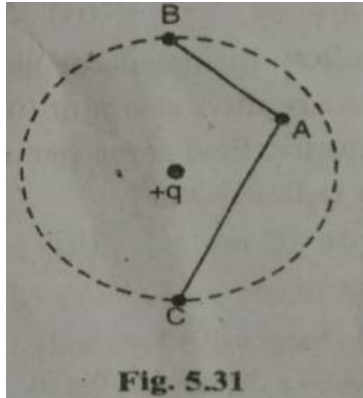
90. A metal sphere of radius 15 cm hangs from a thread in a very large room. What must be the absolute potential of the sphere if the electric field at its surface is to be equal to the breakdown strength of air (3 MVm^{-1})? **450 kV.**
91. Fig. 5.30 shows the electric lines of force emerging from the charged body. If the electric fields at A and B are E_A and E_B respectively and distance between A and B is r , then, $E_A > E_B$.



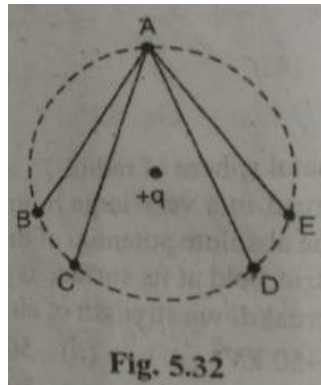
92. A certain charge Q has to be divided into two parts q and $Q-q$ such that when placed at a given distance apart, the force between the two must be maximum. The ratio Q/q is **2.**
93. A hollow insulated conducting sphere is given a positive charge of $10 \mu\text{C}$. What will be electric field at the center of the sphere if its radius is 2 m? **Zero.**
94. Two charges of $+3 \mu\text{C}$ and $-12 \mu\text{C}$ are separated by a distance of 0.4 m. Where should a third charge of $+3 \mu\text{C}$ be placed from $+3 \mu\text{C}$ so that it experiences a zero force? **0.4 m.**
95. An α particle is accelerated through a potential difference of one million volts in an electrostatic generator. Its kinetic energy will be **$2 \times 10^6 \text{ eV}$.**
96. A small metal ball is suspended in a uniform electric field with the help of an insulated thread. If high energy X-ray beam falls on it, **the ball will be deflected in the direction of field.**
97. The electric potential V as a function of distance x (in meters) is given by;
 $V = (5x^2 + 10x - 9)$ volts

The value of electric field at $x=1\text{m}$ would be **20 V/m**.

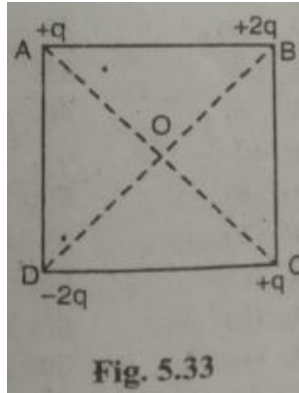
98. In the electric field of a point charge $+q$ (See Fig. 5.31), a charge is carried from A to B and from A to C. Then, **work done is the same in both cases**.



99. An electron is accelerated through 1 V. The velocity of electron is about **$6 \times 10^5 \text{ m/s}$** .
100. A particle carrying a charge of 10^{-5} C begins to move in a uniform electric field of strength 50 Vm^{-1} . After traveling a distance of 1m, the kinetic energy of the particle will be **$5 \times 10^{-4} \text{ J}$** .
101. Electric lines of force and equipotential surfaces **constitute a mutually perpendicular network**.
102. An electron ($e=1.6 \times 10^{-19} \text{ C}$) has been accelerated through a potential difference of 10,000 V. Its energy increases by **10,000 eV**.
103. Each of 1000 equal drops of water is charged to the same potential of 2 V. They coalesce to form a single drop. The potential of this single big drop is **200 V**.
104. The unit of absolute permittivity is **farad/m**.
105. In the electric field of a point charge $+q$ (See Fig. 5.32), a certain charge is carried from point A to B, C, D and E. Then the work done is **zero along any of the paths AB, AC, AD and AE**.



106. What is the effect on a soap bubble when some charge is given to it? **Its size increases**.
107. A unit charge moves on an equipotential surface from point A to B. Then, **$V_A - V_B = 0$** .
108. Four charges are arranged at the corners of a square ABCD as shown in Fig. 5.33. The force on the charge kept at the center O is **along the diagonal BD**.



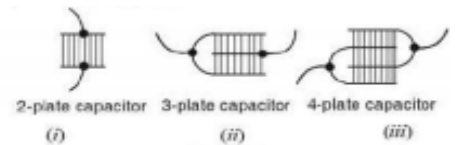
109. When the separation between two charges is increased, the electric potential energy of the charges **may increase or decrease**.
110. When a charge of 3 C is placed in a uniform electric field, it experiences a force of 3000 N. the potential difference between two points separated by a distance of 1 cm within this field is **10 V**.
111. In bringing an electron towards another electron, electrostatic potential energy **increases**.
112. Electron-volt is unit of **energy**.
113. An electron of mass m and charge e is accelerated through a potential difference of V volts in vacuum. Its final velocity will be

$$\sqrt{\frac{2eV}{m}}$$

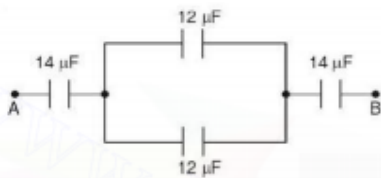
114. A particle A has charge $+q$ and particle B has charge of $+4q$ with each of them having the same mass m . When both the particles are allowed to fall from rest through the same potential difference, the ratio of their speeds v_A/v_B is **1:2**.
115. An α particle is accelerated through a potential difference of 10^6 volts. Its kinetic energy will be **2 MeV**.
116. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at a distance 2 cm from the center of the sphere is **10 V**.
117. Unit of electric flux is **$\text{NC}^{-1} \text{m}^2$** .
118. The electric potential V is given as a function of distance x (meters) by;
 $V = V(5x^2 + 10x - 4)$. Value of electric field intensity at $x=2$ m is **-30 V/m** .
119. Electric field intensity at a point due to a point charge is 20 NC^{-1} and electric potential at that point is 10 J/C . The magnitude of point charge is **$5.56 \times 10^{-10} \text{ C}$** .
120. The electric flux over sphere of radius 1 m is Θ_E . If the radius of the sphere were doubled without changing the charge enclosed, the electric flux would become **Θ_E** .

Chapter # 6 of VK Mehta

1. The capacitance of a capacitor is **directly proportional to** Relative permittivity.
2. An air capacitor has the same dimensions as that of a mica capacitor. If the capacitance of mica capacitor is 6 times that of air capacitor. then relative permittivity of mica is **6**.
3. The most convenient way of achieving large capacitance is by using **Multiplate construction**.
4. Another name of relative permittivity is **specific inductive capacity**.
5. A capacitor oppose **change in voltage**.
6. If a multiplate capacitor has 7 plates each of area 6 cm^2 , then **6 capacitors will be in parallel**.
7. The capacitance of three plate capacitor is **2 times** that of 2-plate capacitor.

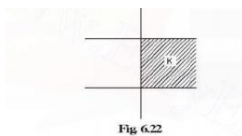


8. The capacitance of 4-plate capacitor is **3 times** that of 2-plate capacitor.
9. Two capacitors of capacitances 3 pF and 6 pF in series will have a total capacitance of **2 pF** .
10. The capacitance of a parallel-plate capacitor does not depend upon **material of plates**.
11. In order to increase the capacitance of a parallel-plate capacitor, one should introduce between the plates a sheet of **mica**.
12. The capacitance of a parallel-plate capacitor depends upon **separation between plate**.
13. The force between the plates of a parallel plate capacitor of capacitance C and distance of separation of plates d with a potential difference V between the plates is **$\frac{CV^2}{2d}$** .
14. A parallel-plate air capacitor is immersed in oil of dielectric constant 2. The electric field between the plates is **decreased 2 times**.
15. Two capacitors of capacitance C_1 and C_2 are connected in parallel. A charge Q given to them is shared. The ratio of charges Q_1/Q_2 is **C_1/C_2** .
16. The dimensional formula of capacitance is **$M^{-1}L^{-2}T^{-4}A^2$** .
17. Four capacitors are connected as shown in figure. What is equivalent capacitance between A and B **is $5.41 \mu\text{F}$** .



18. The empty space between the plates of a capacitor is filled with a liquid of dielectric constant K . The capacitance of capacitor **increases by a factor K** .

19. A parallel plate capacitor is made by stacking n equally spaced plates connected alternately. If the capacitance between any two plates is C , then the resulting capacitance is $(n-1) C$.
20. 64 drop of radius r combine to form a bigger drop of radius R . the ratio of capacitance of bigger to smaller drop is $4:1$.
21. Two capacitor of capacitance $25\mu\text{F}$ when in parallel and $6\mu\text{F}$ when in series. Their individual capacitance is $15\mu\text{F}$ and $10\mu\text{F}$.
22. A capacitor of $20\mu\text{F}$ charged to 500V is connected in parallel with another capacitor of $10\mu\text{F}$ capacitance and charged to 200V . The common potential is 400 .
23. Which of the following does not change when a glass slab is introduced between the plates of a charged parallel plate capacitor? **electric charge**.
24. A capacitor of $1\mu\text{F}$ is charged to a potential of 50V It is now connected to an uncharged capacitor of capacitance $4\mu\text{F}$. The common potential is 10V .
25. Three parallel plates each of area A with separation d_1 between first and second and d_2 between second and third are arranged to form a capacitor. If the dielectric constants are K_1 and K_2 , the capacitance of this capacitor is $\frac{\epsilon_0 A}{\frac{d_1}{K_1} + \frac{d_2}{K_2}}$.
26. The plates of a charged parallel-plate capacitor are pulled apart. **Now p.d. will increases**.
27. A dielectric is introduced between the plates of a capacitor kept at a constant potential difference. The charge on the capacitor is **remains the same**.
28. Two capacitors of capacitances 2pF and 6pF are connected in parallel across a 120V d.c. source. The sum of total charges on the capacitors is **960pC**.
29. Three capacitors of capacitances $3\mu\text{F}$, $9\mu\text{F}$ and $18\mu\text{F}$ are connected once in series and another time in parallel. The ratio of equivalent capacitances in the two cases C_s / C_p will be **1:15**.
30. A dielectric is placed in between two parallel plates of a capacitor as shown in Fig. 6.22. The dielectric constant of the dielectric is K . If the initial capacitance is C , then the new capacitance will be $\frac{C(K+1)}{2}$.



31. Capacitor is charged through a p.d. of 200V and possesses charge of 0.1C . When discharged, it would release an energy of **10 J**.
32. A parallel-plate capacitor with air as medium between plates has a capacitance of $10\mu\text{F}$. The area of the capacitor is divided into equal halves and filled with two media having dielectric constant $K_1 = 2$, $K_2 = 4$. The capacitance of the system will now be **30 μF** .
33. Force acting on a charged particle kept between the plates of a charged capacitor is F . If one of the plates of the capacitor is removed, the force acting on the same particle will become **$F/2$** .

34. Two insulated charged spheres of radii 20 cm and 25 cm respectively and having an equal charge Q are connected by a copper wire and are then separated. Then, **charge on 25 cm sphere is greater.**
35. The capacitance of a parallel plate capacitor is $5 \mu\text{F}$. When a glass plate is inserted between its two plates, its potential reduces to $1/8$ of the original value. The value of dielectric constant of glass is **8.**
36. A parallel-plate capacitor has plate separation t and a capacitance of 100 pF . If a metallic foil of thickness $t/3$ is introduced between the plates. the capacitance would become **150 pF .**
37. The equivalent capacitance of the parallel combination of two capacitors is four times their equivalent capacitance when connected in series. This means that **their capacitances are equal.**
38. Two capacitors, each of capacitance $1 \mu\text{F}$, are connected in parallel and then charged by 200 V d.c. supply. The energy stored by the system is **0.04 J .**
39. Two capacitors of capacitances $0.3 \mu\text{F}$ and $0.6 \mu\text{F}$ respectively are connected in series. The combination is connected across a potential difference of 6 V . The ratio of energies stored by the capacitors will be **2.**
40. Five equal capacitors connected in series have a resultant capacitance of $4 \mu\text{F}$. When these capacitors are connected in parallel and charged to 400 V d.c. , the total energy stored is **8 J .**
41. N drops of mercury of equal radii and possessing equal charges combine to form a bigger drop. The ratio of capacitances of bigger drop to smaller drop is **$N^{1/3}$.**
42. The plates of a capacitor are charged to a potential difference of V volts and then connected across a resistor. The potential difference across the capacitor decreases exponentially w.r.t. time. After one second, the potential difference between the plates is $V/3$. Then after two seconds from the start, the potential difference between the plates is **$V/9$.**
43. In Fig. 6.23, four capacitors are connected as shown. The equivalent capacitance between points A and B is **$6 \mu\text{F}$.**

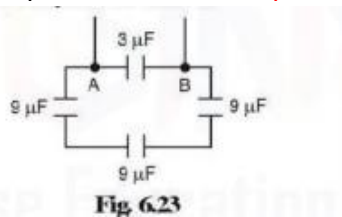


Fig. 6.23

44. In the Fig. 6.24, the p.d. across $15 \mu\text{F}$ capacitor is **50 V .**

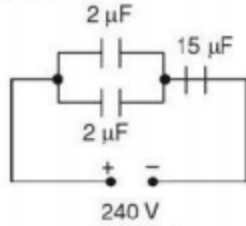


Fig. 6.24

45. The equivalent capacitance between points A and B in Fig 6.25 is $9 \mu\text{F}$.

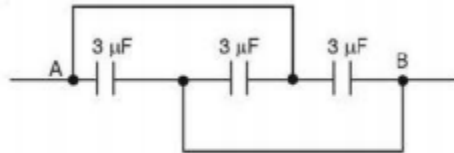


Fig. 6.25

46. The capacitance of earth assuming it to be a spherical conductor of radius 6400 km is $711 \mu\text{F}$.

47. A capacitor of 100 pF is charged to 100 V. The charge accumulated on the plates of the capacitor is 10^{-8}C .

48. Four metallic plates, each of surface area A, are placed at a distance d apart from each other. The two inner plates are connected to point B and the other two plates are connected to point A as shown in Fig. 6.26. The C_{AB} is $\frac{2\epsilon_0 A}{d}$.



Fig. 6.26

49. The potential drop across the plates of capacitor A in Fig 6.27 is 1V .

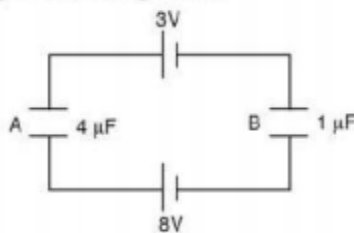


Fig. 6.27

50. A capacitor is charged by a battery. When the capacitor is having air core, the charge on the plates is $70 \mu\text{C}$. When the same capacitor has mica core of dielectric 7, the charge on the plates is $490 \mu\text{C}$.

51. Five capacitors of $10 \mu\text{F}$ capacitance each are connected to a d.c. potential of 100 V as shown in Fig. 6.28. The equivalent capacitance between points A and B is $10 \mu\text{F}$.

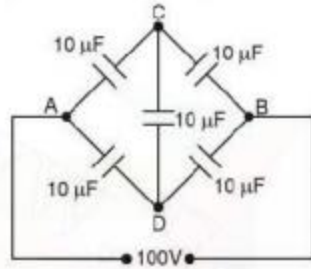


Fig 6.28

52. In Fig. 6.29, the capacitance between points P and Q is $1 \mu\text{F}$. The capacitance C is $\frac{32}{23} \mu\text{F}$.

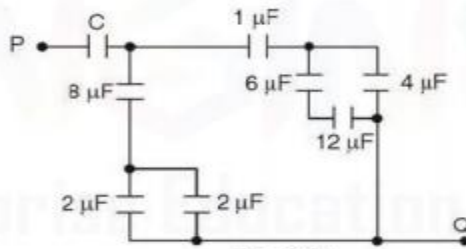


Fig 6.29

53. A capacitor of $100 \mu\text{F}$ capacitance is charged to 200 V. If this charged capacitor is discharged through 2-ohm resistor, the heat generated is 2 J.

54. You are given 4 capacitors, each of capacitance $12 \mu\text{F}$. How would you connect the given capacitors to obtain a capacitance of $9 \mu\text{F}$? 3 in parallel and 1 in series.

55. The effective capacitance between points A and B in Fig. 6.30 is $3 \mu\text{F}$.

56. Four metal plates, each of surface area A on one side, are placed at a distance d from each other as shown in Fig. 6.31. The alternate plates are connected to points A and B.

The capacitance C_{AB} is $\frac{3\epsilon_0 A}{d}$.

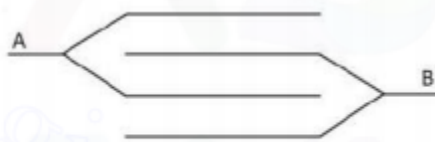


Fig 6.31

57. A capacitor of capacitance $2 \mu\text{F}$ is charged to a potential difference of 200 V. After disconnecting from the battery, it is connected in parallel with another uncharged capacitor. The common potential is 40 V. The capacitance of the second capacitor is 8 μF .

58. An uncharged capacitor with a solid dielectric is connected to a similar air capacitor charged to a potential V_0 . If the common potential after sharing of charges is V, then dielectric constant of the dielectric is $\frac{V_0 - V}{V}$.

59. A parallel plate air capacitor has a capacitance C. If air between the plates is exhausted completely, the new capacitance would become slightly less than C.

60. Two spherical conductors A and B of radii a and b ($b > a$) are placed concentrically in air. A is given a charge $+Q$ and B is earthed. The equivalent capacitance of the system is

$$4\pi\epsilon_0 \frac{ab}{b-a}.$$

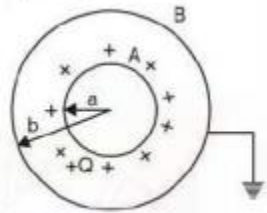


Fig 6.32

61. Two spherical conductors A and B of radii a and b ($b > a$) are placed concentrically in air. B is given a charge $+Q$ and A is earthed. The equivalent capacitance of the system is

$$4\pi\epsilon_0 \frac{b^2}{b-a}.$$

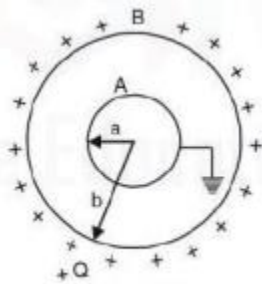


Fig 6.33

62. A capacitor C is charged to a potential V and disconnected from the source. Another equal capacitor is now connected in parallel with it. What is the total energy in the two capacitors finally to that in the single capacitor individually **1:2**.
63. A parallel plate capacitor is filled with three dielectrics of dielectric constants K_1 , K_2 , and K_3 as shown in Fig. 6.34. If A be the area of each plate and d is the separation between plates. then capacitance of this system is $\frac{\epsilon_0 A}{d} \left(\frac{K_1}{2} + \frac{K_2 K_3}{K_2 + K_3} \right)$.

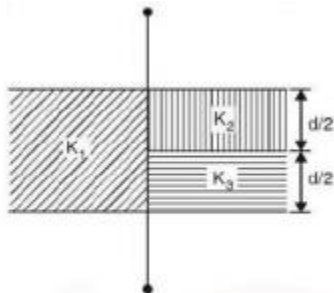


Fig 6.34

64. Two metal plates form a parallel plate capacitor. The distance between the plates is d the medium is air Now a metal plate of thickness $d/2$ and of the same area is inserted completely between on the plates. The capacitance **is doubled**.
65. Two insulated metallic spheres of $3 \mu\text{F}$ and $5 \mu\text{F}$ capacitance are charged of 300 V and 500 V respectively. When they are connected by a wire, the loss of energy is **0.0375 J** .

66. Two spherical conductors A and B of radii a and b ($b > a$) are placed concentrically in air. The two are connected by a copper wire as shown in Fig. 6.35. The capacitance of the system is $4\pi\epsilon_0 b$.

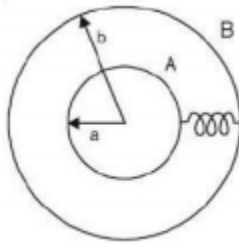


Fig 6.35

67. A $6\ \mu\text{F}$ capacitor is so charged that the potential difference across its plates becomes $50\ \text{V}$. The work done in the process is $7.5 \times 10^{-3}\ \text{J}$.
68. Two capacitors of capacitances $4\ \mu\text{F}$ and $6\ \mu\text{F}$ are connected in parallel. This combination is then connected in series to a third capacitor. If the equivalent capacitance of the arrangement is $10/3\ \mu\text{F}$, the capacitance of the third capacitor is $5\ \mu\text{F}$.
69. Six metal plates of each with a surface area A on one side are placed a distance d from each other. The alternate plates are connected to point P and Q as shown in Fig. 6.36. The capacitance of the system is $\frac{5\epsilon_0 A}{d}$.

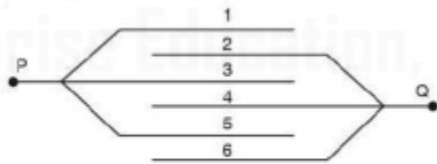


Fig 6.36

70. Two capacitors of $3\ \mu\text{F}$ and $6\ \mu\text{F}$ are connected in series and the combination is charged to a potential of $120\ \text{V}$. The potential difference across $3\ \mu\text{F}$ capacitor is $80\ \text{V}$.
71. A parallel plate capacitor with air as medium between the plates has a capacitance of $10\ \mu\text{F}$. The capacitor is divided into two halves and filled with two media as shown in Fig. 6.37 having dielectric constants $K_1 = 2$, $K_2 = 4$. The capacitance of the system is now $30\ \mu\text{F}$.

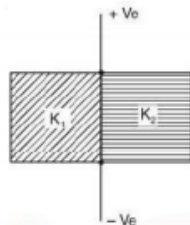


Fig 6.37

72. At the instant, the switch S is closed in Fig. 6.38. The voltage across the capacitor is zero.

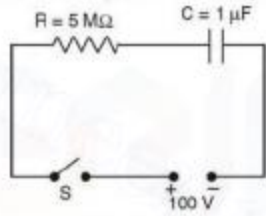


Fig 6.38

73. The time constant of the circuit in Fig. 6.38 is **5s**.
74. When the switch S in Fig. 6.38 is closed, the voltage across the capacitor will be 100V in about **25s**.
75. If there were no resistance in the circuit shown in Fig 6.38, the time constant of the circuit would be **zero**.
76. When the switch S in Fig 6.38 is closed, the rate of rise of voltage across the capacitor is **20 V/second**.
77. The resultant capacitance between points P and Q in Fig. 6.39 is **1 μF**.

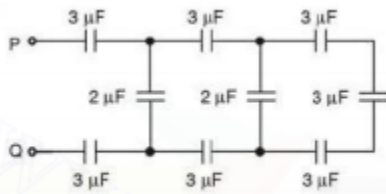


Fig 6.39

78. If you need a capacitor with $C = 0.25 \mu\text{F}$ and you have only ones in the storeroom with capacitance of $1 \mu\text{F}$, how will you obtain the desired capacitance? **connect four available capacitors in series**.
79. The effective capacitance between point X and Y in Fig. 6.40 is, assuming $C_2 = 10\mu\text{F}$ and all other capacitors are of $4 \mu\text{F}$. **is $4 \mu\text{F}$** .

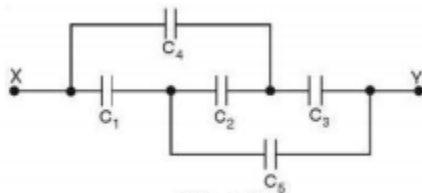


Fig 6.40

80. The charging of a capacitor through a resistance follows **Exponential Law**.
81. Three capacitors of capacitances $6 \mu\text{F}$ each are available. The minimum and maximum capacitances which may be obtained are **$2 \mu\text{F}$ and $18 \mu\text{F}$** .
82. The plate separation of a capacitor is 0.02 mm filled completely with a dielectric medium. If the dielectric strength of the material is 20 kV/mm , the maximum voltage rating of the capacitor is **400V**.
83. An RC circuit is connected to a 300 V dc. source. The voltage across the capacitor after 1 time constant is **189.6V**.

84. A parallel plate capacitor is filled with two dielectrics as shown in Fig 6.41. Area of each plate is A and plate separation is d. The dielectric constants are K_1, K_2 respectively. The capacitance of the system is $\frac{\epsilon_0 A}{d} \left(\frac{K_1 + K_2}{2} \right)$.

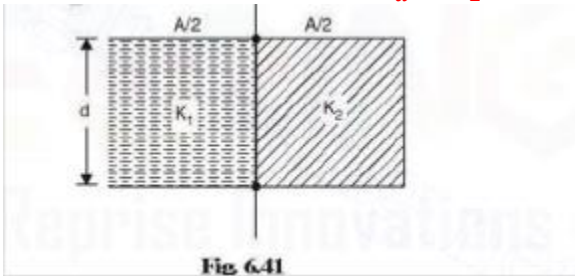


Fig 6.41

85. A series circuit has a capacitance of $10 \mu\text{F}$ and resistance of $5\text{M}\Omega$. It is connected to a d.c. source of emf 100 V . The value of steady state current is **zero**.
86. For the circuit shown in Fig 6.42, the value of voltage across the capacitor 0.2 s after the switch is closed is **27.9 V** .

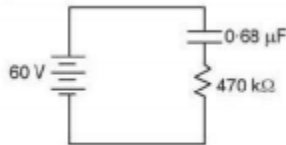


Fig 6.42

87. A trimmer is a variable capacitor in which capacitance is changed by changing **distance between plates**.
88. A capacitor of $0.1 \mu\text{F}$ is charged and then discharged through a $10 \text{ M}\Omega$ resistor. The time in which the capacitor loses half of its potential is **0.693 s** .
89. A gang capacitor is a variable capacitor in which capacitance is changed by changing **plate area**.
90. A parallel plate capacitor with plate area A and separation d is filled with dielectrics as shown in Fig. 6.43. The dielectric constants are K_1, K_2 respectively. The capacitance of the system is $\frac{2\epsilon_0 A}{d} \left(\frac{K_1 K_2}{K_1 + K_2} \right)$.

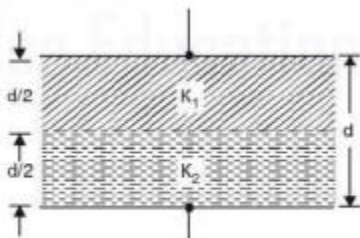


Fig 6.43

91. In a variable capacitor, the dielectric used is generally **air**.

92. Four metallic plates. each of surface area A on one side, are placed at a distance d from each other. The plates are connected as shown in Fig. 6.44. Then capacitance of the system between P and Q is $\frac{2\epsilon_0 A}{3d}$.

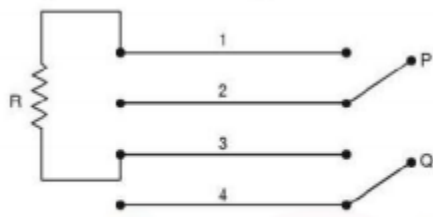
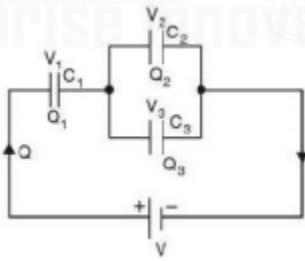


Fig 6.44

93. A capacitor of $0.25 \mu\text{F}$ charged to a certain potential is discharged through $40 \text{ M}\Omega$ resistor. Time taken by the one-third charge to escape is 4.1 s .
94. Three capacitors $C_1, C_2,$ and C_3 are joined to a battery as shown in Fig. 6.45. The correct conditions are $Q_1 = Q_2 + Q_3$ and $V_1 = V_2 + V_3$



95. The area of the plates of a parallel-plate capacitor is 10 cm^2 . The paper ($K= 2.5$) of thickness 0.005 cm entirely fills the space between the plates. If the paper can tolerate a field of $5 \times 10^7 \text{ V/m}$. the maximum potential difference upto which the capacitor can be charged is 2500 V .
96. The equivalent capacitance between points A and B in the circuit shown in Fig. 6.46 is $2.18 \mu\text{F}$.

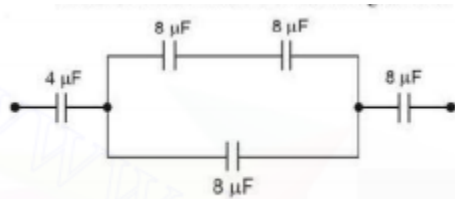


Fig 6.46

97. The capacitance of a spherical capacitor is $1 \mu\text{F}$. If the spacing between the two spheres is 1 mm . the radius of the outer sphere is 3 m .
98. Four identical capacitors are connected in series with a 10 V battery as shown in Fig. 6.47. The point N is earthed. The potentials of points A and B are 7.5 V and -2.5 V .

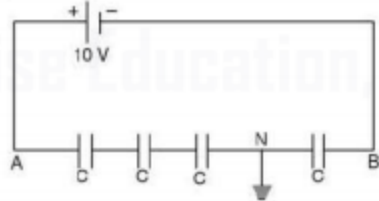


Fig 6.47

99. A metal sphere mounted on an insulating rod carries a charge of 6 nC when its potential is 200 V higher than the surroundings. The capacitance of the capacitor formed by the sphere and surrounding is **30pF**.
100. Three capacitors of $2\ \mu\text{F}$, $3\ \mu\text{F}$ and $4\ \mu\text{F}$ are connected in series with a 6 V battery. When the current ceases to flow, the charge on $3\ \mu\text{F}$ capacitor is **$5.5\ \mu\text{C}$** .
101. An uncharged parallel plate capacitor having a dielectric constant K is connected to a similar air cored parallel plate capacitor charged to a potential V . The two share the charge and the common potential is V' . The dielectric constant K is $\frac{V-V'}{V'}$.
102. The equivalent capacitance between points A and B in Fig. 6.48 is $1\ \mu\text{F}$. The value of capacitance C is **$4\ \mu\text{F}$** .

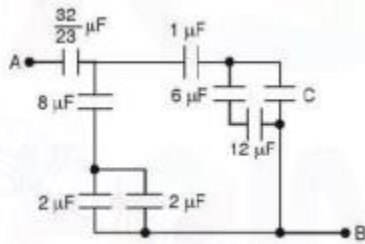


Fig 6.48

103. A capacitor of capacitance C is fully charged by a 200 V d.c. supply. It is then discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat $2.5 \times 10^2\ \text{J/kg/K}$ and of mass 0.1 kg. If the temperature of the block rises by 0.4 K, then the value of C is **$500\ \mu\text{F}$** .
104. A spherical capacitor has 10 cm and 12 cm as the radii of the spheres. The space between the two is filled with a medium of dielectric constant 5. If the outer sphere is earthed, the capacitance of the system is $\frac{10}{3} \times 10^{-4}\ \mu\text{F}$.
105. Two parallel plate capacitors of capacitances C and $2C$ are connected in parallel and charged to potential V . The battery is then disconnected. The space between the plates of the first is filled with a dielectric of dielectric constant K . The potential across the capacitors is $\frac{3V}{K+2}$.
106. A capacitor of $20\ \mu\text{F}$ charged to 500 V is connected in parallel with another of $10\ \mu\text{F}$ capacitance charged to 200 V. The loss of energy is **0.3 J**.
107. When a capacitor is charged from a battery **the two plates acquire exactly equal and opposite charges**.
108. The capacitance of an isolated sphere is $5\ \mu\text{F}$ in air. If it is placed in a medium of relative permittivity 5, then its capacitance will be **$25\ \mu\text{F}$** .

109. Two identical capacitors are connected in parallel and charged to a potential of V . They are separated and then connected in series. The p.d. across series combination is **2 V**.

110. The equivalent capacitance of two capacitors in parallel is four times their equivalent capacitance in series. This means that **the capacitances are $1 \mu\text{F}$ and $4 \mu\text{F}$** .

111. The value of charge on each plate of capacitor C shown in Fig 6.49 is $\frac{CE R_1}{R_1 + r}$.

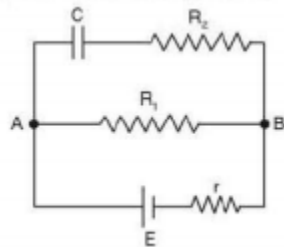


Fig 6.49

112. In Fig 6.50, a potential of $+1200 \text{ V}$ is given to point A and point B is earthed. What is the potential at point P? **is 400 V** .

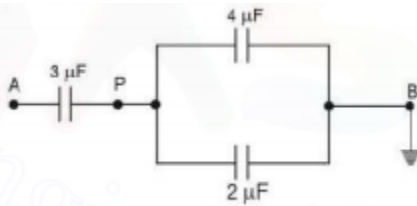


Fig 6.50

113. A slab of copper of thickness b is inserted between the plates of a parallel plate capacitor as shown in Fig. 6.51. If $b = d/2$, then ratio of capacitances of the capacitor after and before inserting the slab **is $2:1$** .

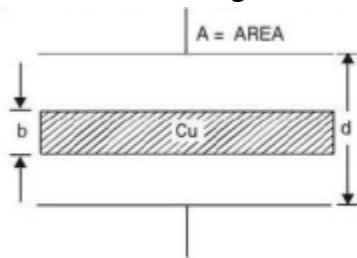


Fig 6.51

114. A parallel-plate capacitor is given a charge of $3 \mu\text{C}$. A dielectric of relative permittivity 3 is inserted between the plates of the capacitor so as to fill the space between the plates completely. The induced charge on each face of the dielectric is **$2 \mu\text{C}$** .

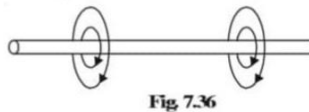
115. Number of $1 \mu\text{F}$ capacitors are available. Each capacitor gets punctured if potential difference just exceeds 500 V across the capacitor. It is desired to have an arrangement

of 2 μF capacitance with applied voltage of 3000 V. The number of capacitors required is 72.

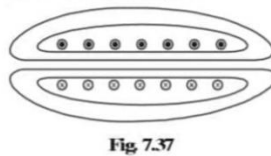
Chapter# 7 MCQS

1. When a magnet is heated **it loses magnetism**
2. The magnetic material used in permanent magnets is **hardened steel**
3. The magnetic material used in temporary magnets is **Soft iron**
4. Magnetic flux density is a **Vector quantity**
5. The relative permeability of a ferromagnetic material is 1000. Its absolute permeability will be **$4\pi \times 10^{-3} \text{ H/m}$**
6. The main advantage of temporary magnets is that we can **change the magnetic flux**
7. One weber is equal to **10^8 lines**
8. Magnetic field intensity is a **vector quantity**
9. The absolute permeability of a material having a flux density of 1 Wb/m^2 is 10^{-3} H/m . The value of magnetizing force is **1000 AT/m**
10. When the relative permeability of a material is slightly less than 1, it is called a **diamagnetic material**
11. The greater percentage of substances are **paramagnetic**
12. When the relative permeability of material is much greater than 1, it is called **ferromagnetic material**
13. The magnetic flux density in an air-cooled coil is 10^{-2} Wb/m^2 . With a cast iron core of relative permeability 100 inserted, the flux density will become **1 Wb/m^2**
14. Which of the following is more suitable for the core of an electromagnet **soft iron**
15. The source of a magnetic field is **current loop**
16. A magnetic needle is kept in a uniform magnetic field. It experiences **a torque but not a force**
17. The unit of pole strength is **Am**
18. When the relative permeability of a material is slightly more than 1, it is called a **paramagnetic material**
19. AT/m is the unit of **magnetizing force**
20. A magnetic needle is kept in a non-uniform magnetic field. It experiences **a force and a torque**
21. Magnetic flux passes more readily through **iron**
22. Iron is ferromagnetic **below 770°C**

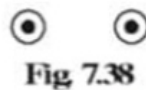
23. The relative permeability of a material is 0.9998. It is **diamagnetic**
24. Magnetic lines of force **cannot intersect at all**
25. Demagnetizing of magnets can be done by **all of the above** i.e. (rough handling, heating, magnetizing in opposite direction)
26. The relative permeability of iron is of the order of **10^4**
27. Which of the following has the highest permeability? **ferromagnetic**
28. The unit of relative permeability is **none of the above** i.e. (A/m, H/m, Wb/m²)
29. A magnet is kept in air surrounded by an iron ring. The magnetic lines of force from the magnet will be **crowded in the ring**
30. The distance between two magnetic poles is doubled and their pole strengths are also doubled. The force between them **remain unchanged**
31. Fig. 7.36 shows the magnetic field around a conductor. In which direction is the current flowing? **From left to right**



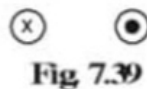
32. Fig. 7.37 shows a cross-section of a coil. Based on dot and cross notation, which end of the coil is the North Pole? **Right**



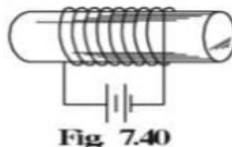
33. Will the two conductors in Fig. 7.38 repel or attract? **Attract**



34. Will the two conductors in Fig. 7.39 will attract or repel? **Repel**



35. Which end of the coil shown in Fig. 7.40 is the North Pole? **Right**



36. The force on the conductor in Fig. 7.41 will be **upward**

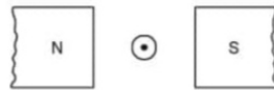


Fig 7.41

37. In Fig. 7.42, the armature will move in **anticlockwise direction**

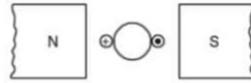


Fig 7.42

38. If the iron in Fig. 7.43 is withdrawn, current being the same, then flux density will **decrease**

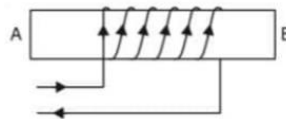


Fig 7.43

39. The magnetic intensity in the solenoid in Fig. 7.43 will be **greater at the Centre of the coil**

40. When a charged particle moves through a magnetic field, it suffers a change in **direction**

41. By increasing the number of turns 3 times in a toroid, the magnetic flux **will becomes three times**

42. A wire of length 2 m carries a current of 10A, What is the force acting on it when it is placed at an angle of 45° to the uniform magnetic field of 0.15 T? $\frac{3}{\sqrt{2}} \text{ N}$

43. A rectangular loop carrying current I is situated near a long straight wire such that the wire is parallel to one of the sides of the loop and is in plane of the loop. If a steady current I is established in the wire as shown in Fig. 7.44, the loop will **move toward the wire**

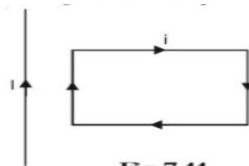


Fig 7.44

44. A current is passed through a straight wire. The magnetic field established around it has magnetic lines of force **oval in shape and endless**

45. In a moving coil galvanometer, the deflection becomes one-half when the galvanometer is shunted by a 20Ω resistor. The galvanometer resistance is **20Ω**

46. A charged particle enters a magnetic field perpendicular to the magnetic lines of force the path of the particle is **circular**

47. A charged particle enters a magnetic field at an angle of 30° to the direction of magnetic field. Its path becomes **helical**
48. Magnetic field is caused by **moving positive and negative charges both**
49. It is required to convert a galvanometer of current range 15 mA and voltage range 750 mV into an ammeter of range 2.5A. What is the value of shunt resistance required? **0.3Ω**
50. A conductor of length 1 m carrying current of 1 A is placed parallel to a magnetic field of 1 Wb/m^2 . The magnetic force acting on the conductor is **zero**
51. A current is flowing toward north along a power line. The direction of magnetic field above it is (neglecting earth's field) toward **east**
52. Two parallel wires each 0.5 m long are at a distance of 1 m from each other. If current flowing through each wire is 1A, the force between the wires is **10^{-7} N**
53. A galvanometer of 25Ω resistance is connected to a source of e.m.f 2V along with a resistance of $3\text{k} \Omega$. Full scale deflection of 30 units is obtained. When $3\text{K} \Omega$ resistance is replaced by a resistance R, the deflection becomes 20 units. The value of R is approximately **$4.5 \text{ k} \Omega$**
54. An electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on electron along **south**
55. A strong magnetic field is applied on a stationary electron. Then the electron **remains stationary**
56. A straight wire carrying a current of I_1 amperes is placed along the axis of a circular current-carrying coil. What is the force of interaction between the wire and the coil if a current of I_2 Amperes flows in the coil. The radius of coil is r meters **zero**
57. A galvanometer with a scale divided into 100 equal divisions has a current sensitivity of 10 divisions per mA and a voltage sensitivity of 2 divisions per mV. To convert it into an ammeter of range 5A, the necessary shunt resistance required is **$5/499 \Omega$**
58. Deflection in a galvanometer falls from 50 divisions to 20 divisions when a 12Ω shunt is applied. Galvanometer resistance is **18Ω**
59. A conducting loop of radius r carries a constant current I . It is placed in a uniform magnetic field B_0 such that B_0 is perpendicular to the plane of the loop. The magnetic force on the loop is **zero**
60. An electron is shot in steady electric and magnetic fields such that its velocity v , electric field E and magnetic field B are mutually perpendicular. The magnitude of $E = 1 \text{ volt/cm}$ and that of

B is 2 tesla. If the magnetic force cancels the electrostatic force on the electron, then velocity of electron is 50 ms^{-1}

61. The magnetic field in a moving coil galvanometer is made radial to **make the scale linear**

62. The resistance of an ideal ammeter is **zero**

63. An infinitely long conductor is bent into the shape as shown in Fig. 7.45. It carries a current I and the radius of the circular loop is r . Then magnetic field at the Centre of the loop is $\frac{\mu_0 I}{2\pi r} (\pi - 1)$

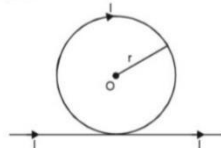


Fig 7.45

64. A portion of a conducting wire is bent in the form of a semicircle of radius r as shown in Fig.

7.46. At the Centre O of the semicircle the magnetic field will be $\frac{\mu_0 \pi I}{4\pi r}$

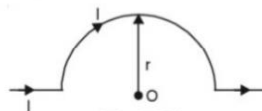


Fig 7.46

65. A length of wire carries a steady current. It is first bent to form a circular plane coil of one turn. The same length is now bent more sharply to give a double loop of smaller radius. The magnetic field produced at the Centre by the same current is **four times of its first value**

66. A wire $PQRS$ formed by joining two semi circular wires of radii R_1 and R_2 carries a current I as shown in Fig. 7.47. The magnitude of magnetic field at the Centre O is $\frac{\mu_0 I}{4} \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$

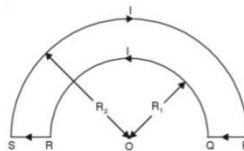


Fig 7.47

67. A current I amperes flows in the loop having circular arc of radius r meters subtending an angle θ radian as shown in Fig. 7.48 The magnitude of magnetic field at the Centre O is $\frac{\mu_0 I \theta}{4\pi r}$

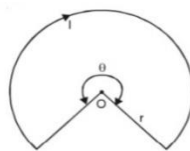


Fig 7.48

68. In Fig 7.49, what is the magnetic field at point O ? $\frac{\mu_0 I}{4r} + \frac{\mu_0 I}{4\pi r}$

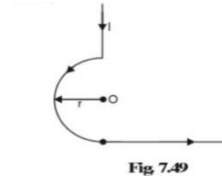


Fig 7.49

69. A helium nucleus makes full rotation in a circle of radius 0.8m in 2 seconds. The value of magnetic field B at the Centre of circle is $10^{-19} \mu_0$

70. Magnetic field inside a current carrying solenoid is **directly proportional to current**

71. A positively charged particle moving with velocity \vec{v} enters a uniform magnetic field \vec{B} , The particle will experience the largest force when angle between \vec{v} and \vec{B} is 90°

72. The magnetic field at a point P which is at a distance of is 4 cm from a long current carrying conductor is 10^{-3} T. The magnetic field at a distance 12 cm from the conductor is 3.33×10^{-4} T

73. What is the reading of the voltmeter in Fig. 7.50 **4V**

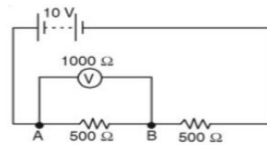
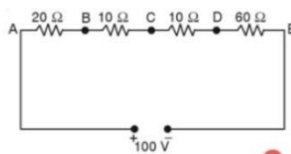


Fig 7.50

74. A voltmeter of resistance 998Ω is connected across a cell of e.m.f . 2V and internal resistance 2Ω . The percentage error in the reading of the voltmeter is **0.2%**

75. In the circuit shown in Fig. 7.51. The point B is earthed. What is the potential at point D? **-20V**



76. An electron beam is moving horizontally towards east. If this beam passes through Uniform magnetic field directed upward, then in which direction will the beam be deflected?

Towards north

77. If a proton be moving vertically upward and the magnetic force on it be acting towards north in a horizontal plane, then what will be the direction of the magnetic field? **Towards east in the horizontal plane**

78. In an ammeter, 5 per cent of main current passes through the galvanometer. If resistances of the galvanometer and shunt are G and S respectively, then, $S = \frac{G}{19}$

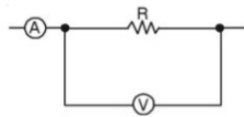
79. Which of the following is likely to have the largest resistance? **A voltmeter of range 10V**

80. A 2MeV proton is moving perpendicular to a uniform magnetic field of 2.5T. The force on the proton is $8 \times 10^{-12} \text{ N}$

81. Currents of 10A and 2 A are passed through two parallel wires A and B respectively in opposite directions. If the wire A is infinitely long and the length of wire B is 2 m, the force on conductor B at a separation of 10 cm from A will be $8 \times 10^{-5} \text{ N}$

82. In a hydrogen atom, the electron moves in an orbit of radius 0.5A making 10^{16} revolutions per second. The magnitude of magnetic moment associated with the orbital motion of electron in Am^2 is 1.25×10^{-23}

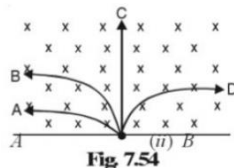
83. In Fig. 7.52, the ammeter reads 5A and voltmeter reads 50 V. The actual resistance R is **Greater than 10 Ω**



84. In Fig. 7.53, the ammeter reads 5 A and voltmeter reads 50 V. The actual resistance R is **less than 10 Ω**



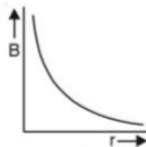
85. A neutron, a proton, an electron and an σ -particle enter a region of uniform magnetic field with equal velocities. The magnetic field is perpendicular and directed into the paper. The track of the particles are labeled in Fig. 7.54. The electron follows the track **D**



86. In Q. 85, σ -particle follows the track **B**

87. An electron moves with a uniform velocity v and enters a region of uniform magnetic field B . If v and B are parallel to each other, then electron will **continue to move in the same direction**

88. To send 10% of the main current through a galvanometer of resistance 99Ω , the value of shunt resistance required is **11Ω**
89. The sensitivity of a galvanometer is 60 divisions/ ampere. When a shunt is used, the sensitivity becomes 10 divisions/ ampere. If the galvanometer resistance is 20Ω , the value of shunt is **4Ω**
90. The resistance of an ideal voltmeter is **infinite**
91. A voltmeter has a resistance of G ohm and range V volts. The value of resistance used in series to convert it into voltmeter of range nV is **$(n-1)G$**
92. An ammeter has a resistance of G ohm and range I amperes. The value of resistance used in parallel to convert it into an ammeter of range nI is **$\frac{G}{n-1}$**
93. A galvanometer has a resistance of G ohms It is shunted by a resistance of S ohm. How much resistance should be added in series so that the main current remains unchanged? **$\frac{G^2}{G+S}$**
94. A voltmeter has a resistance of $5 \times 10^4 \Omega$. What should be the additional resistance connected in series with it so as to increase the range 3 times? **10^5 ohm**
95. An electron having a charge e moves with a velocity v in X-direction. A magnetic field acts on it in Y-direction. The force on the electron acts in **Z-direction**
96. A cable carries a current of 1A vertically upward. The magnetic field produced by it at a point 10 cm north will be **$2 \times 10^{-6} \text{ tesla west}$**
97. A moving coil galvanometer has a rectangular coil of dimensions $0.02 \text{ m} \times 0.05 \text{ m}$. It consists of 200 turns. The coil is placed in a uniform radial field of 0.5 T . The restoring torque per angular twist is $10^{-6} \text{ Nm per degree}$. What is the minimum current measured by it if its coil turns through 45° ? **$4.5 \times 10^{-4} \text{ A}$**
98. Which of the graphs in Fig. 7.55 shows the variation of magnetic flux density B with r from a long straight wire carrying a steady current. **Ans. fig**



99. A moving electric charge will produce **both electric and magnetic field**
100. A current carrying coil is subjected to a uniform magnetic field. The coil will orient so that its plane becomes **parallel to the magnetic field**

101. A horizontal wire AB of mass 3×10^{-3} kg and length one meter carries a current of 9.8A. The wire lies in the field acting perpendicular to the wire. What is the magnitude of the field which can support the weight of wire? **3×10^{-3} T**

102. There is a uniform magnetic field acting in a plane downward perpendicular to sheet of paper (see Fig 7.56). The path indicated by an arrow could be travelled by **electron**

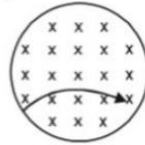


Fig. 7.56

103. A vertical straight conductor carries a current vertically upward. A point P lies to the east of it a small distance and another point Q lies to the west at the same distance. Neglecting earth's magnetic field, the magnetic field at P is **same as at Q**

104. A charged particle of charge q is moving with a velocity v along the axis of a current carrying solenoid. The magnetic force on the particle is **zero**

105. Two parallel conductors, each carrying 20A experience a force of 300N. If the medium is filled with oil of $\mu_r = 3$, then force between them will be **900 N**

106. If an electron enters a uniform magnetic field obliquely, the path of the electron will become **a spiral**

107. The current in a wire is directed towards east and the wire is placed in a magnetic field directed toward north. The force on the wire is **vertically upward**

108. A solenoid is 1 m long and 3 cm in mean diameter. It has five layers of windings of 100 turns each and carries a current of 5A. What is the magnetic field at its Centre? **0.314×10^{-2} T**

109. A current flows in a conductor from east to west. The direction of magnetic field at a Point above the conductor is **toward north**

110. A charged particle moves through a magnetic field perpendicular to it. The energy of the particle will **remain unchanged**

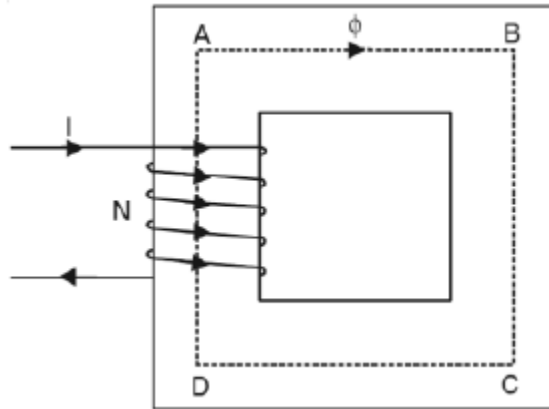
111. In the above question, the momentum of the particle will **change**

112. A very long solenoid has 800 turns per meter length of the solenoid. A current of 1.6A flows through it. Then magnetic flux density at the end of the solenoid on its axis is nearly **8×10^{-4} T**

113. A proton is moving along the negative direction of x-axis in a magnetic field directed along the positive direction of y-axis. The proton will be deflected along the negative direction of **z-axis**
114. Two long straight parallel conductors, 10 cm apart, carry currents 5A each in opposite directions. Then the magnetic flux density at a point mid-way between them is **$4 \times 10^{-5} \text{ N}$**
115. A galvanometer may be converted into ammeter or voltmeter. In which of the following cases the resistance of the device will be the largest? **A voltmeter of range 10V**
116. Particles having positive charge occasionally come with high velocity from sky towards the earth. On account of the magnetic field of earth, they would be deflected toward **east**
117. Through two parallel wires A and B, 10A and 2A of current is passed respectively in opposite directions. If wire A is infinitely long and the length B is 2m, the force on the conductor B, which is situated at 10 cm distance from A, will be **$8 \times 10^{-5} \text{ N}$**
118. A uniform electric field and a uniform magnetic field are produced, pointed in the same direction. An electron is projected with its velocity pointed in the same direction **the electron velocity will decrease**
119. Two thin long parallel wires separated by a distance b are carrying current i amperes each. The magnitude of force per unit length exerted by one wire on the other is $\frac{\mu_0 i^2}{2\pi b}$
120. Two identical coils carrying equal currents have a common Centre and their planes are at right angles to each other. What is the ratio of magnitudes of the resultant magnetic field and the field due to each coil at the Centre? **$\sqrt{2} : 1$**
121. A direct current is sent through a helical spring. The spring tends **to get shorter**
122. An electron accelerated through a potential difference V passes through a uniform transverse magnetic field and experiences a force F . If the accelerating potential is increased to $2V$. The electron in the same magnetic field will experience a force **$\sqrt{2} F$**
123. A strong magnetic field is applied to a stationary electron. Then the electron **remains stationary**
124. An ammeter of range 1A has a resistance of 0.9Ω . To extend the range to 10A, the value of shunt required is **0.1Ω**
125. A voltmeter has a resistance of 100Ω and measures 10 V. How can it be used to measure 50V **400Ω in series**

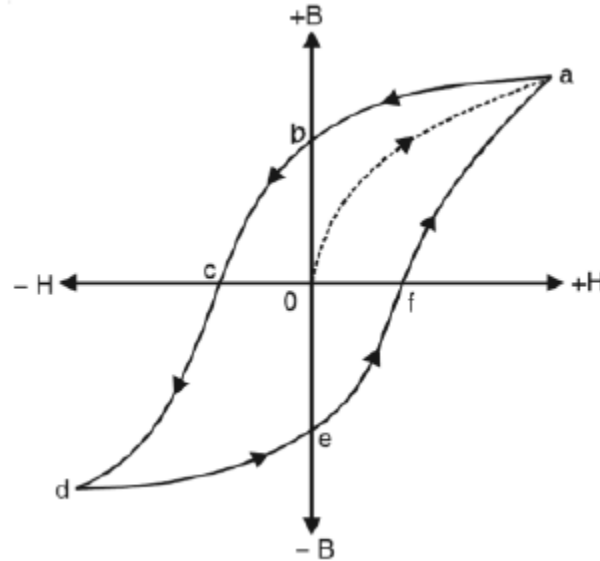
Chapter # 8 MCQs

1. In the following figure, the magnetic circuit is the path **ABCD**.

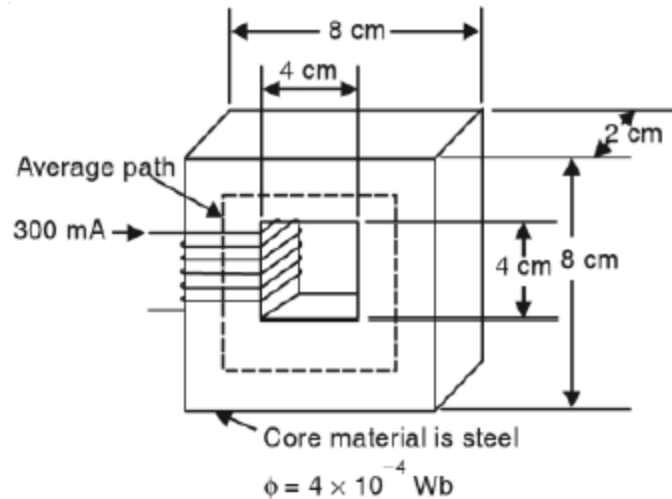


2. If l is the magnetic path in above figure, then magnetizing force is **NI/l** .
3. The reluctance of the magnetic circuit shown above is **NI/Φ** .
4. The SI unit of reluctance is **AT/Wb** .
5. A magnetic circuit has a m.m.f. of 400 AT and a reluctance of 2×10^5 AT/Wb. The magnetic flux in the magnetic circuit is **2×10^{-3} Wb**.
6. A 2 cm long coil has 10 turns and carries a current of 750 mA. The magnetizing force of the coil is **375 AT/m**.
7. A magnetic device has a core with cross section of 1 *inch*². If the flux in the core is 1 mWB, then flux density (1 inch = 2.54 cm) is **1.55 T**.
8. The reluctance of a magnetic circuit varies as $\frac{\text{length}}{\text{area}}$.
9. The reluctance of a magnetic circuit is **inversely proportional to** relative permeability of the material comprising the circuit.
10. M.M.F. in a magnetic circuit corresponds to **e.m.f.** in an electric circuit.
11. Permeance of a magnetic circuit is **directly proportional to** area of x-section of the circuit.
12. The magnitude of AT required for air gap is much greater than that required for iron part of a magnetic circuit because **air has the lowest relative permeability**.
13. In electro-mechanical conversion devices (e.g. motors and generators), a small air gap is left between the rotor and stator in order to **permit mechanical clearance**.
14. A magnetic circuit carries a flux ϕ_i in the iron part and a flux ϕ_g in the air gap. Then leakage coefficient is $\frac{\phi_i}{\phi_g}$.
15. The value of leakage coefficient for electrical machines is usually about **1.15 to 1.25**.
16. The reluctance of a magnetic circuit depends upon **flux density in the circuit**.
17. The B-H curve for **air** will be a straight line passing through the origin.
18. Whatever may be the flux density in **air**, the material will never saturate.
19. The B-H curve of **soft iron** will not be a straight line.
20. The B-H curve is used to find the m.m.f. of **iron part** in a magnetic circuit.

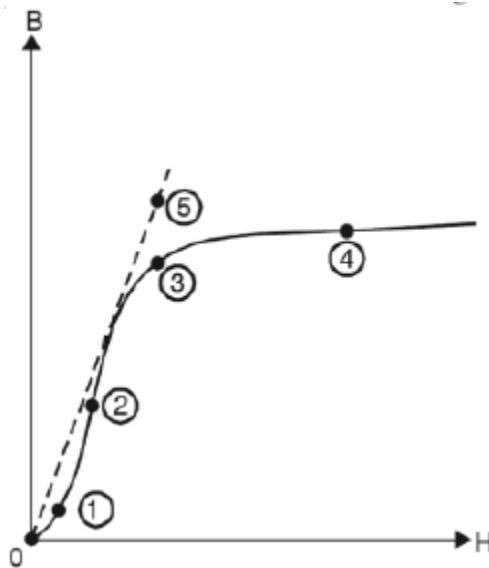
21. A magnetizing force of 800 AT/m will produce a flux density of 1 mWb/m^2 in air.
22. The saturation flux density for most magnetic materials is about 2 Wb/m^2 .
23. Hysteresis is the phenomenon of **lagging of B behind H** in a magnetic circuit.
24. In the figure shown, the point **a** represents the saturation condition.



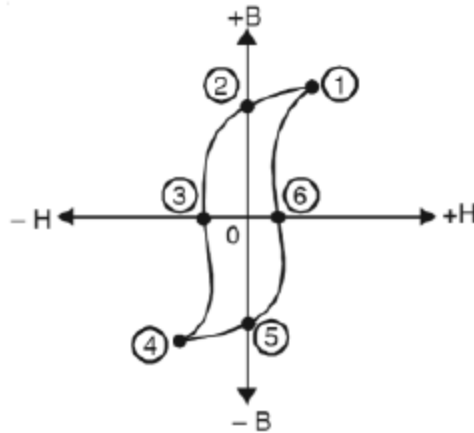
25. In above figure, **ob** represents the residual magnetism.
26. In above figure, **oc** represents the **coercive force**.
27. If a magnetic material is located within a coil through which alternating current (50 Hz frequency) flows, then **50** hysteresis loops will be formed every second.
28. Out of the following materials, the area of hysteresis loop will be least for **silicon steel**.
29. The materials used for the core of a good relay should have **narrow** hysteresis loop.
30. The magnetic material used for **permanent magnets** should have a large hysteresis loop.
31. When transformer primary is fed from a.c., its core heats up due to **hysteresis loop**.
32. Hysteresis loss can be reduced by **using material of narrow hysteresis loop**.
33. **0.24 m** is the mean magnetic length of the magnetic circuit shown below.



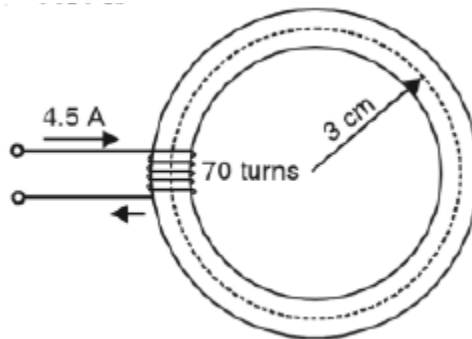
34. The magnetic flux density in the core in above figure is **1 T**.
35. If the magnetizing force required at the working flux density in above figure is 400 AT/m (from B-H curve), the required number of turns is **320**.
36. The hysteresis loop for materials having high retentivity is **wide**.
37. Fringing effect is ignored in a magnetic circuit if air gap is **small**.
38. An air-cored coil carries steady current. If air-core is replaced by a ferromagnetic material, the flux density in the core will **increase**.
39. Another name for B-H curve shown below is **magnetization curve**.



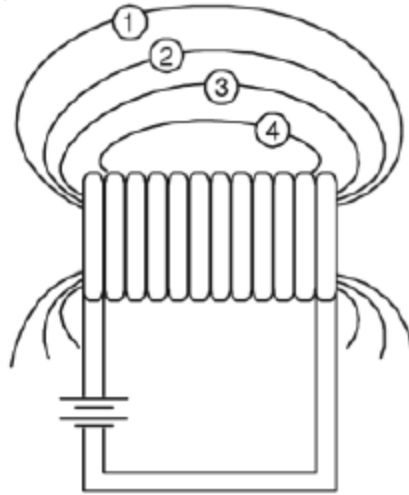
40. Point 4 in B-H curve in above figure is the saturation region.
41. Point 5 on the B-H curve in above figure represents the average permeability.
42. The hysteresis loop of a material having low retentivity is **narrow**.
43. The SI unit of μ_0 is **Wb/AT-m**.
44. The point 2 in below figure represents **residual flux density**.



45. Point 6 in above figure corresponds to coercive force.
46. The hysteresis loop shown in above figure is for **soft iron**.
47. The loop would appear **narrower** for a material with much less retentivity.
48. The unit of relative permeability is **a number**.
49. The hysteresis loss in a ferromagnetic material is **directly proportional to area of loop**.
50. At low frequencies, the material used for transformer cores is **silicon iron**.
51. At higher frequencies, the material used for transformer cores is **ferrite**.
52. The permeability in the core in given figure is $6 * 10^{-5} \frac{Wb}{(AT-m)}$. The flux density in the core is **0.1 T**.

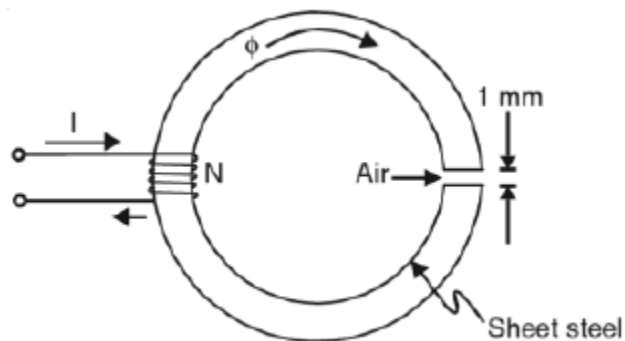


53. 4th flux line in below figure represents leakage.

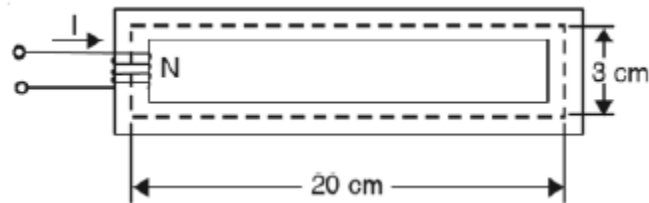


- 54. In non-magnetic materials, descending and ascending B-H curves **coincide**.
- 55. The magnetic field intensity in a material is **3980 AT/m** whose relative permeability is 1 when the flux density is 0.005 T.
- 56. The relative permeability of air is **1**.
- 57. The slope of B-H curve of a material gives its **absolute permeability**.
- 58. The value of relative permeability of ferromagnetic materials **decreases** with increase in temperature.

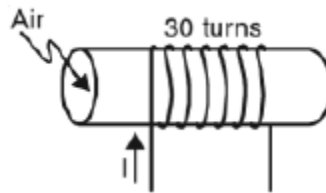
59. In the figure below, the cross-section of the core is circular and has radius 1.25 m. The mean length of the core is 30 cm. If the flux in the core is 0.6×10^{-5} Wb, then H in air gap is $9.71 \times 10^5 \frac{AT}{m}$.



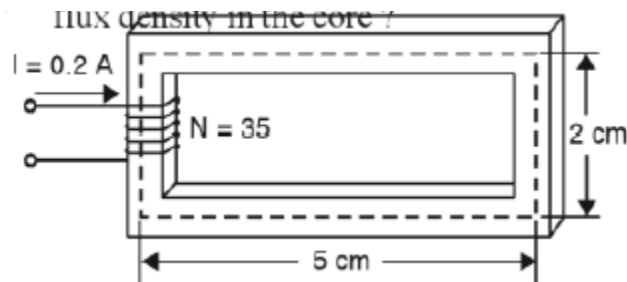
60. An electromagnet uses **soft iron core**.
61. Magnetic shields are made from materials having **low permeability**.
62. The hysteresis cycle for the material of a transformer is **tall and narrow**.
63. The current in the winding shown below is 3.2 A. If the winding has 60 turns, the magnetic field intensity in the core is **417.4 AT/m**.



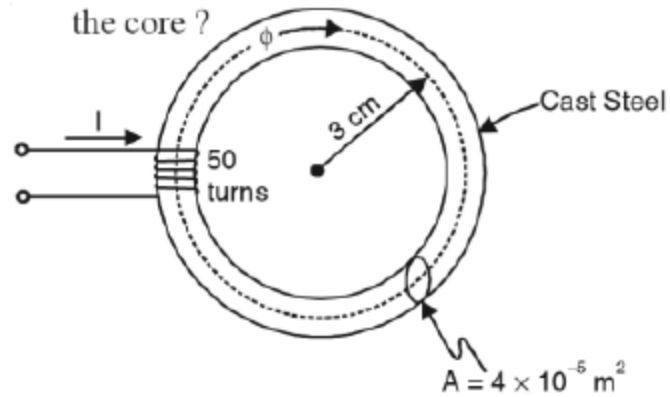
64. The ohm's law for magnetic circuit is **m.m.f. = flux x reluctance**.
65. The Curie temperature of iron is **770°C**.
66. Ferromagnetic materials exhibit hysteresis when **they are not taken even to saturation**.
67. A permanent magnet should have **high coercivity**.
68. The B-H curve of a ferromagnetic material is **non-linear**.
69. Magnetic materials that have high retentivity have a **nearly square hysteresis loop**.
70. The hysteresis loop of the core material of a transformer should have a **small area**.
71. The magnetic intensity in the air core of the solenoid shown below is changed by 20 AT/m. The flux density in the core is changed by **$2.51 \times 10^{-5} T$** .



72. In an electromagnet, the flux density at saturation should be **high**.
73. A permanent magnet should have **high remanence**.
74. In practical magnetic circuits, the air-gap is kept **very small**.
75. The minimum relative permeability of a material can be **slightly less than 1**.
76. The relative permeability of the rectangular core is shown below. The flux density in the core is **0.047 T**.



77. The cross-section area of the core shown below is $4 \times 10^{-5} m^2$. If the flux in the core is $3 \times 10^{-5} Wb$, the flux density in the core is **0.75 T**.



78. In the above question, current of **1.772 A** must be supplied to the winding to produce the given flux. Given that H corresponding to working flux density is 470 AT/m (from B-H curve of cast steel).

79. Due to the fringing at the air gaps in a magnetic circuit, the effective area of the air gaps is **increased**.

80. The magnetic potential difference in a magnetic circuit is given by **HI** .

Chapter 9 electromagnetic induction

The basic requirement for inducing EMF in a coil is that **there should be change in flux linking the coil**

The EMF induction in a coil is **directly proportional to** the rate of change in flux linkages.

The EMF induced in a coil of N turns is given by **$-Nd\phi/dt$**

The direction of induced EMF in a conductor can be determined by **fleming Left and rule**

In fig 9.25 the conductor is moving upward the direction of induced EMF is **from B to A**

In fig 9.26 the direction of induced EMF in the conductor A is **out of plane of paper**

In fig 9.26 the rate of change of flux linkages of conductors A and B is **maximum**

The EMF induced in a **transformer** is the statically induced EMF.

The EMF induced in a **DC generator** is dynamically induced EMF.

In fig 9.27 one single conductor of length meters moves at right angles to uniform field of B wb/m² with a velocity of m/s The EMF induced is **B/V**

In fig 9.28 the compound of velocity does not induced any EMF in conductor is **v cos**

Inductance oppose **change** in current in a circuit.

If the number of turns of a coil is increased its inductance **is increased.**

If the relative permeability of the material surrounding the coil is increased inductance of the coil **is increased .**

Inductance in a circuit **delay the change in current**

The inductance of a coil is **inversely proportional to** reluctance of magnetic path

If the number of turns of a coil is increased two times its inductance is **increased 4 times**

A circuit has inductance of 2H if the circuit current changes at the rate of 10 A/seconds than self induced EMF is **20V**

A current of 2A through a coil sets up flux linkages of 4 wb-turn the inductance of the coil is **2 H**

An air core choke is used for **radio frequency** applications.

If a 10 turns coil has a second layer of 10 turns wound over the first than total inductance will be about **four times** the original reluctance.

An iron cored coil of 10 turns has reluctance of 100 AT/Wb the inductance of a coil **1 H**

An iron cored coil has an inductance of 2 H if the reluctance of the magnetic path is 200 AT/Wb the number of turns on the coils **20**

The mutual inductance between two coils is **inversely proportional to** reluctance of magnetic path.

Mutual inductance between two coils can be decreased by **moving the coil apart.**

Mutual inductance between two coils 4H if current in one coil changes at the rate of 2 A/second the EMF induced in the other coil is **8V**

If in fig 9.29 flux $\Phi = 2\text{Wb}$, $N = 20$ and $I = 20\text{A}$ then mutual inductance between the coil is **2H**.

If in fig 9.29 $N_1 = 100$, $N_2 = 1000$ and mutual inductance between the coils is 2H the reluctance of magnetic circuit is **$5 \times 10^4 \text{ AT/Wb}$**

If the coefficient of coupling between two coils is increased mutual inductance between the coils is **increased**

The maximum mutual inductance between the coils shown in fig 9.29 is given by **under root $L_1 L_2$**

The mutual inductance between two coils is zero when fluxes produced by them **are at right angles to each other**

The mutual inductance between two unity coupled coils of 9H and 4H is **6H**

In fig 9.30 the mutual inductance between two coils is **4.8mH**

In above question the maximum inductance between the coils can be **6mH**

In fig 9.31 the inductance of coil 1 is **5H**

In fig 9.31 the mutual inductance between the coils is **8H**

In fig 9.31 the coefficient of coupling between the coils is **0.8**

The coefficient of coupling between the primary and secondary of an iron cored transformer is about **0.9**

In fig 9.32 the inductance of coil L1 will become **12H**

In fig 9.32 the inductance of coil L2 will become **7H**

The total inductance of the circuit in fig 9.32 is **19H**

The coefficient of coupling in fig 9.32 is **0.5**

Total inductance in fig 9.33 is **7H**

In an RL series circuit the time constant is given by **L/R second**

In fig 9.34 the rate of change of current at the instant of closing the switch is **15A/sec**

The time constant of the circuit shown in the fig 9.34 is **0.5 sec**

The final steady value of current in Fig 9.34 will be **7.5A**

After closing the switch in fig 9.34 the current will reach the steady value in about **2.5 sec**

The magnetic energy stored in inductor is **directly proportional to square of currents.**

An 8H choke is carrying a current of 500 mA the energy stored in the magnetic field is **1 J**

When current in R-L series circuit is constant then **Voltage across L is zero**

The lifting power of an electromagnetic is **directly proportional to square of flux density**

Eddy current power loss is directly proportional to **square of max flux density**

If the frequency of flux is increased two times the eddy current power loss is **increased 4 times**

A flux =1m Wb passes a strip having an Area $A= 200 \text{ cm}^2$ and placed at an angle of 60° to the direction of uniform magnetic field the value of magnetic flux density is **0.058T**

A series combinations of L and R is connected to a battery of EMF E, having negligible resistance the final value of current depends upon **E & R**

When the rate of change of current is unity the induced emf is equal to **inductance of coil**

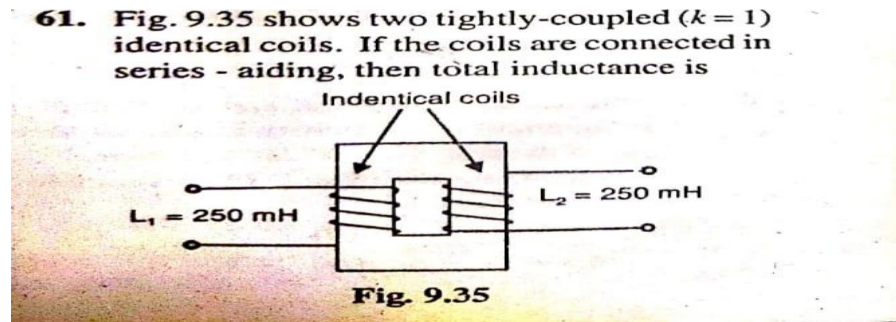
The mutual inductance between two coils each of N turns is M if a currents i in the first coil is brought to zero in a time t than emf induced in the second coil is **Mi/t**

If L and R denote inductance and resistance respectively than dimensions of L/R are **$M^2L^2T^{-2}$**

Two pure inductors each of self inductance L are connected in parallel but are well separate from each other than total inductance is **L/2**

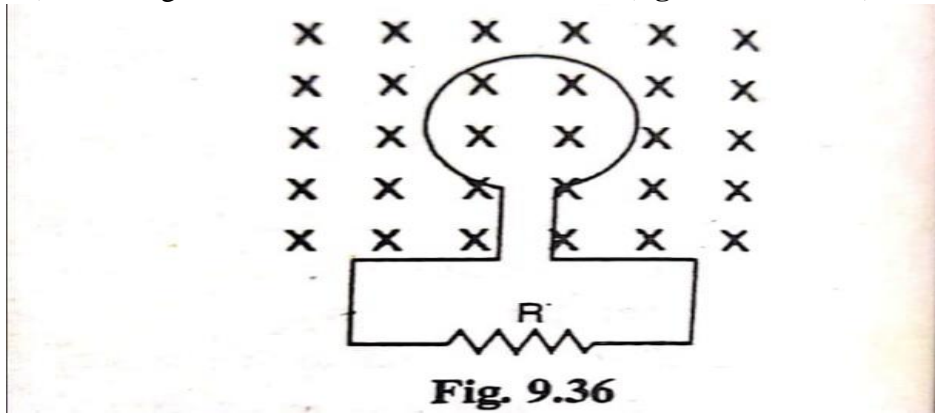
CHAPTER 9 (61-115)

Questions 61-62 refers to figure below.



- 61). If coils are connected in series-aiding, then total inductance is **1H**
- 62). If coils are connected in series-opposition, then total inductance is **zero**.
- 63). Two series opposing inductors have value of 1H and 7H. Total impedance is **2.1H** if mutual inductance is 300mH.
- 64). Coefficient of coupling is **0.23**.
- 65). Two uncoupled 3H inductors are connected in parallel. Their total inductance is **1.5H**.
- 66). A coil having 500 square loops each of side 10cm is placed normal to a magnetic flux which increases at the rate of 1T/sec. The induce emf is **5V**.
- 67). A 100mH coil carries a current of 1A. Energy stored in the magnetic field is **0.05J**.
- 68). The mutual inductance between two coils depend on **medium between coils and separation between coils**.
- 69). A coil has 200 turns and area of 70cm^2 . The magnetic field perpendicular to the plane of coil is 0.3Wb/m^2 and takes 0.1 sec to rotate through 180 degree. The magnitude of induce emf is **8.4V**.
- 70). An air core solenoid has 1000 turns and is 1m long. Its cross-sectional area is 10cm^2 . The self-inductance of coil is **1.25mH**.
- 71). When the number of turns in the coil is doubled without any change in length of the coil, the self-inductance becomes **four times**.
- 72). When the magnetic is in the motion relative to a coil, an induce emf is produce. It does not depends on **resistance of a coil**.

73). The magnitude of emf in the coil is **-31mv.** (figure 73-74 9.36)



74). Direction of induce current through resistor R is **from left to right.**

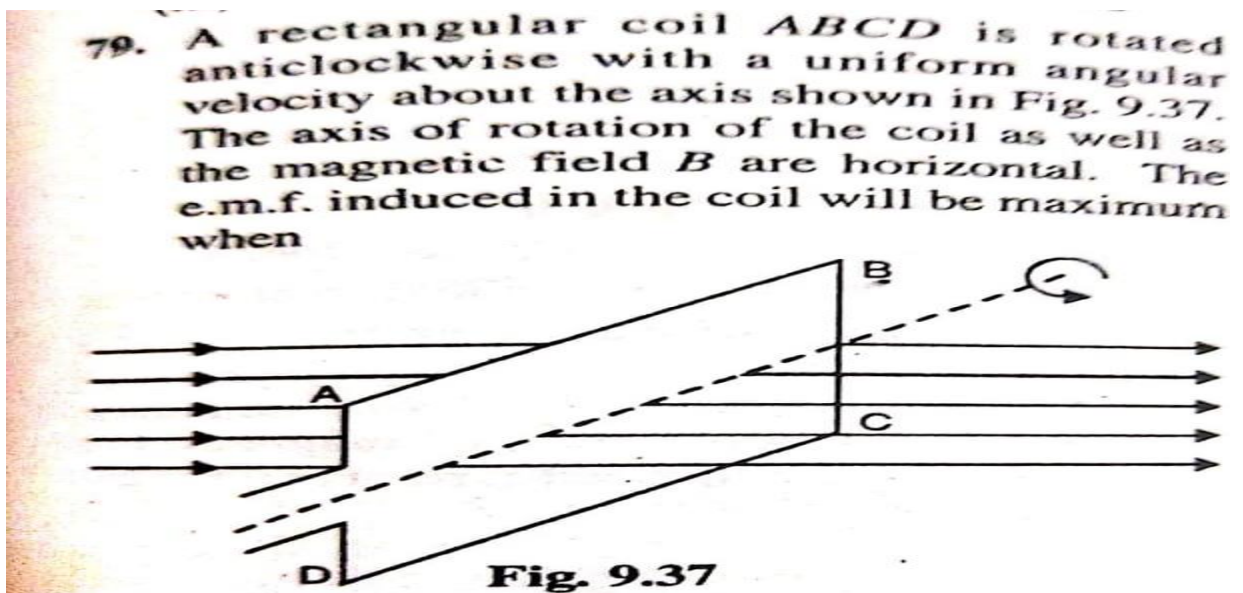
75). The current in the self-inductance $L=40\text{mH}$ is to be increased uniformly from 1A to 11A in 4 msec . The induced emf produced in L during the process is **100v.**

76). A metallic ring is attached to a wall of the room. When the north pole of magnet is brought near the ring the induced current in the ring is **anti-clockwise.**

77). Flux in a close circuit of resistance 10ohm varies with time t according to relation $\phi=6t^2-5t+1$. The magnitude of induce current at 0.25sec is **0.2A.**

78). The normal drawn to the surface of a conductor makes an angle θ with direction of field B . The flux passing through the area is **$AB \cos \theta$.**

79). The induce emf in the coil is maximum when **plane of coil is parallel to field.** (figure 9.37)

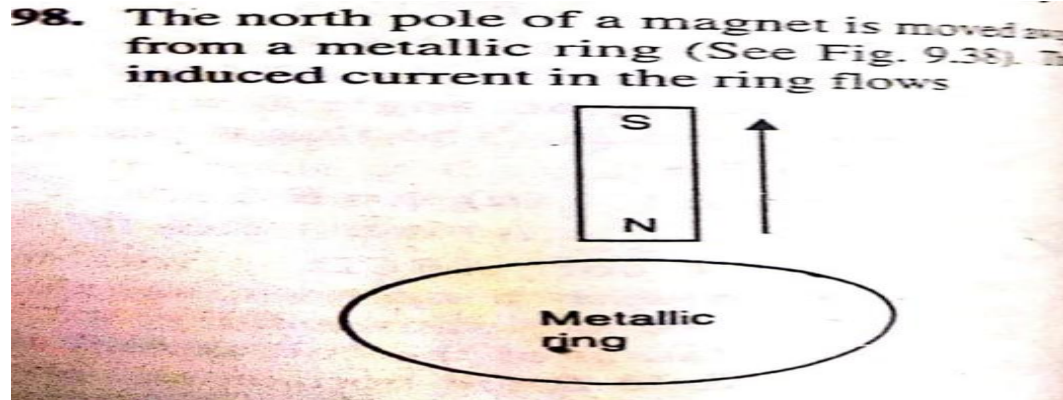


80). When loop of wire is rotated in a 2-pole magnetic field, the direction of induced emf changes once in every $\frac{1}{2}$ **revolutions.**

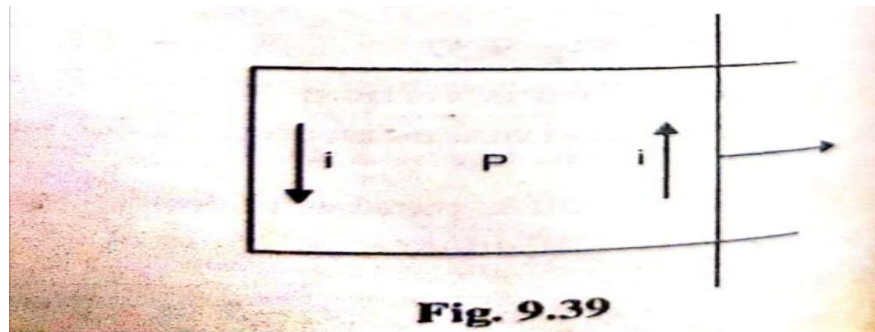
- 81). When a magnet is moved with its N-pole towards a close coil, the nearer end of coil act as **N-pole**.
- 82). A coil of wire of radius r has 600 turns and a self-inductance of 108mH. Self-inductance of a similar coil of 500turns will be **75mH**.
- 83). Two coils X and Y are placed in the circuit such that current changes by 2A in coil X and magnetic flux change of 0.4 Wb occurs in coil Y. The mutual inductance of coil is **0.2H**.
- 84). A coil of resistance of 20ohm and inductance of 5H has been connected to 100V battery. The energy stored in the coil is **62.5J**.
- 85). A square coil of area 10^{-2} m^2 is placed perpendicular to a uniform magnetic field of intensity of 10^3 T . The magnetic flux through the coil is **10wb**.
- 86). A coil is wound on former of rectangular cross-section. If all the linear dimensions of the former are increased by a factor 2 and the number of turns per unit length of coil remains unchanged, the self-inductance of coil increases by a factor of **8**.
- 87). The self-inductance of coil is 5mH. If a current of 2A flows, the magnetic flux through the coil is **0.01Wb**.
- 88). A copper rod length l is rotated about the end perpendicular to a uniform magnetic field of flux density B with constant angular velocity ω . the induced emf between the two ends is $\frac{1}{2} B l^2 \omega$.
- 89). A 50Hz A.C of peak value 1A flows through the primary of transformer. If mutual inductance between primary and secondary is 1.5H. the peak voltage induced in secondary is **300V**.
- 90). A circular disc 10cm in diameter rotates at 1800rev/min about an axis through its center and right angle to disc. A uniform M.F of 1 Wb/m^2 is perpendicular to disc. The potential difference between the axis of disc and rim is **0.23V**.
- 91). If time constant of RL series circuit is 40ms, it takes **200ms** to discharge.
- 92). In a disc of R-L series circuit when current is at its steady state value, the counter emf is **zero**.
- 93). When dc series RL circuit is broken, the counter emf is **hundreds of times larger than dc source voltage**.
- 94). A 0.7H inductor has 30ohm winding resistance. It will take **116.7ms** to reach dc current to its maximum value in this inductor.
- 95). The polarity of the counter emf by a falling current is **series-aiding** the source voltage.
- 96). When the core of inductance coil is moving away from its winding, the inductance of coil **decrease**.

97). A coil having number of turn N and rotated in a uniform magnetic field B , with an angular velocity ω . The maximum emf induced in the coil is $NAB\omega$.

98). The north pole of the magnet is moved away from a metallic ring. The induced current in the ring flows **first clockwise and then anti clockwise**.



99). The moveable wire is moved in the right causing an anticlockwise induced current. The direction of magnetic-field producing the region is **points vertically downward**.



100). Choke coil works on the principle of self-inductance.

101). A current of 4A through coil of 1000 turns produce a magnetic flux of 400 lines. The self-inductance of the coil is **1mH** .

102). A magnet is moved (a) quickly (b) slowly towards a coil. The emf induced in the coil is **larger in case (a)**.

103). The current through a choke coil increases from zero to 6A in 0.3 seconds and an induced emf of 30V is produced. The inductance of choke coil is 1.5H .

104). A current through a choke coil of inductance 5H is decreasing at the rate of 2A/sec . The emf induced in the coil is **10V** .

105). The flux in a closed circuit of resistance 10ohm is given by $\phi = 6t^2 + 5t + 2$. the induced current at $t = 1$ second is **1.7A** .

106). A coil of radius R has 400 turns and a self-inductance of 32mH. The inductance of similar coil of 300turns is **18mH**.

107). A car moves on the plain road. The emf induced in the axial connecting the two wheels is maximum when it moved at **pole**.

108). The direction of induced current through resistor R is **X to Y**.

108. In Fig. 9.40, the changing (increasing) magnetic field is passing perpendicular to the plane of the coil and directed into the paper. What is the direction of induced current through the resistor R ?

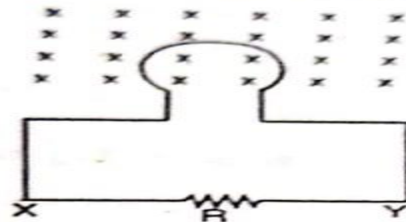


Fig. 9.40

109). A horizontal straight conductor of length l is placed along east-west direction. It is allowed to fall under the gravity from height h at a place where the horizontal component of earth magnetic field H and the vertical component is V . The maximum emf induced in the conductor is **$Hl(2gh)^{1/2}$**

110). When magnetic flux linking a conductor changes **an emf always induced**.

111). When a wire loop is rotated in a 2-pole magnetic field the direction of emf changes once in every $\frac{1}{2}$ **revolutions**.

112). The area enclosed by a circular coil of 200 turns in 10cm^2 . its place is kept perpendicular to a magnetic field of 0.3 wb/m^2 and is rotated through 180 degree. The change in magnetic flux is **$6 \cdot 10^{-4}\text{ Wb}$**

113). A solenoid has 2000 turns wound over length of 0.3m. The area of x-section is $1.2 \cdot 10^{-3}\text{ m}^2$. Around its cross sectional a coil of 300 turns is wound. If an initial current of 2A is reversed in 0.25 sec, the emf induced in the coil is **0.048V**.

114). **Current will be 6.32A in 0.6sec. (figure)**

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will be (after switch is closed) 6.32 A in a time

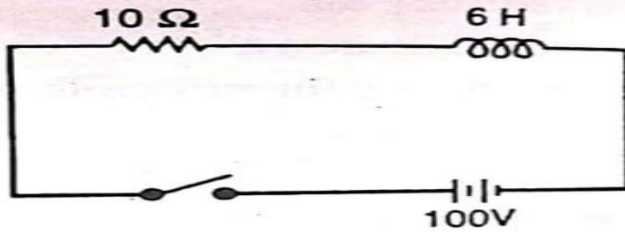


Fig. 9.41

115). If N is the number of turns of the coil the inductance varies as N^2 .

Chapter 10 :Chemical Effects of Electric Current

1. The current conduction through the solution of an electrolyte is by **Ions**.
2. For the process of electrolysis, we require **d. c. supply**
3. A positively charged atom is sometimes called **cation**.
4. The mass of an element deposited or liberated at an electrode during electrolysis is the quantity of electricity passed through the electrolyte. **directly proportional to**
5. The E.C.E. of the copper is 304×10^{-6} gm/C. If during electrolysis, 2C of electricity is passed through the solution of CuSO_4 , then, mass of copper deposited on cathode is **608×10^{-6} gm**
6. Out of the following, E.C.E. of is largest. **Silver**
7. During electrolysis, mass of an element liberated at the electrode is of the element. **directly proportional to chemical eq. wt**
8. The relation between E.C.E. (Z) and chemical equivalent weight (E) is that **E/z is constant for all elements**
9. When the same quantity of electricity is passed through silver and copper voltmeters in series, the masses of silver (Ag) and copper (Cu) deposited on the respective cathodes will be in the ratio of their **chemical equivalent weights**
10. The e.m.f. of a cell does not depend upon **size and spacing of electrodes**
11. If two different elements in the electrochemical series are used as the electrodes in a cell, the one higher in the series **will be negative plate**
12. The major drawback of a primary cell is that **chemical action is not reversible**
13. The efficiency of a primary cell is about **70%**
14. The most commonly used cell is **lead-acid cell**
15. In practice, the state of discharge of a lead-acid cell is determined by **specific gravity of the electrolyte**
16. When a lead-acid cell is fully charged **specific gravity of H_2SO_4 rises to about 1.28**
17. A multiplate construction is used in a lead-acid cell to **increase the capacity of the cell**.
18. The commercial lead-acid cell has 15 plates. The number of negative plates will be **8**
19. The life of the positive plates of a lead-acid cell is roughly **Half** that of negative plates.
20. If the specific gravity of electrolyte (H_2SO_4) in a lead-acid cell increases, the internal resistance of the cell **is decreased**.
21. The material of positive plates of a lead-acid cell is **poorer in conductivity** than those of negative plates.
22. The specific gravity of the electrolyte (H_2SO_4) of a lead-acid cell is about 1.25. The cell is about **75% charged**
23. The internal resistance of a lead-acid cell is mainly due to **electrolyte**
24. A lead-acid cell has 13 plates. In the absence of manufacturer's data, the charging current should be **6A**
25. The ampere hour efficiency of a lead-acid cell is about **90%**
26. The state of charge of a nickel-iron cell is determined by **e.m.f. of the cell**
27. Nickel-iron batteries are used in **submarines**
28. The state of charge of nickel-cadmium cell is determined by **e.m.f. of the cell**.
29. The chief disadvantage of a nickel-cadmium cell is that it is **very expensive**
30. The Faraday constant F is equal to (N is Avogadro number and $e = 1.6 \times 10^{-19}$ C) **$F = Ne$**
31. In producing chlorine through electrolysis 100W power at 125V is being consumed. How much chlorine per min is liberated? ECE of chlorine is 0.367×10^6 kg/C **17.61×10^3 kg**
32. Faraday constant F in terms of chemical equivalent E and electrochemical equivalent z is **$F = E/z$**
33. The mass of different substances liberated in electrolysis by the same quantity of electricity are proportional to **ratio of atomic mass and valence**
34. When 1 C of charge is allowed to flow through an electrolytic, the mass of substance deposited is equal to **E.C.E of that substance**.
35. A brass plate (5 cm \times 4 cm) is to be plated on both sides with a coating of thickness 0.25 mm. Calculate the strength of current so that work may be completed in 5 hours. Electrochemical equivalent of silver is 0.00112g/C and density of silver = 10.5g/cm^3 **0.521A**
36. A battery of E.M.F. 3V and internal resistance 1 ohm is connected to a copper voltmeter and a current of 1 amp flows in the circuit. What is the resistance of the volt meter? **1 ohm**

37. A certain charge liberates 0.8 gm of O^2 . The same charge will liberate how many gm of silver
10.8g
38. In how much time, one litre of H_2 will be collected by 5 A current? If $Z=1 \times 10^{-8} \text{kg/C}$ and density of $H_2=0.09 \text{kg/m}^3$ **30min**
39. A current of 16 ampere flows through molten NaCl for 10 minute. The amount of metallic sodium that appears at the negative electrode would be **2.3g**
40. A silver and zinc voltmeters are connected in series. A current of I amperes is passed through them for time t. if m gram of zinc is liberated, then the mass of silver deposited is nearly **3.3m**
41. How much electricity should be passed through an electrolyte solution for one second so that one gram equivalent of the substance is liberated at the electrode? **96500 C**
42. A 2Ω resistor and a silver voltmeter of resistance 2Ω are connected in series across a cell. How will the rate of deposition of silver be effected if a resistance of 2Ω is connected in parallel with the voltmeter? **It will increase by 12.5%**
43. A charge of $4.8 \times 10^5 \text{ C}$ passes through a solution of copper sulphate. The number of Cu^{++} ions liberated from the electrolyte is **1.5×10^{24}**
44. In order to find the E.C.E of a substance, its chemical equivalent is multiplied by E.C.E of **Hydrogen**
45. What is the volume of hydrogen liberated at N.T.P a charge which liberates 0.3175g of copper?
112 c.c.
46. 965 C charge deposits 1.08 g of silver when passed through silver nitrate solution. What is the chemical equivalent of silver? **108**
47. A charge q liberated n moles of oxygen. The number of moles of hydrogen liberated by the same charge is **2n**
48. Assume that 10 A current deposits 10.8 silver in 900s. How much copper would be deposited by 9 A in 1200s? **3.8g**
49. Silver and copper voltmeter are connected in parallel to a 12V battery of negligible internal resistance. In 30 minutes, 1g of silver and 1.8g of copper are. At what rate, the battery is delivering energy? Given E.C.E of $\text{Ag} = 11.2 \times 10^{-4} \text{g/C}$ and E.C.E of $\text{Cu} = 6.6 \times 10^{-4} \text{g/C}$. **24 J/s**
50. Two voltmeters, one of silver and another of trivalent aluminium are connected in series. The ratio of number of silver atoms and the number of aluminium atoms deposited during time t is **3:1**
51. E.C.E of copper was determined by taking copper sulphate and copper chloride as electrolyte. If z_1 and z_2 are the E.C.E determined in two cases then **$z_1 = z_2$**
52. If 0.5A current is passing through a copper voltmeter, the number of Cu^{++} ions at cathode in 10s is ($z=3.3 \times 10^{-4} \text{g/C}$) **1.5×10^{19}**
53. To deposit 23kg of sodium on electrode during electrolysis, the charge required is **$9.65 \times 10^7 \text{ C}$**
54. A battery of 3 V and internal resistance Ω is connected to a copper voltmeter. If a current of 1.5A flows through the circuit, what is the resistance of the voltmeter? **1 Ω**
55. 0.296 g of Cu is deposited from a CuSO_4 solution by a current of 1 A flowing for 15 minutes. The E.C.E. of copper is **$3.3 \times 10^{-4} \text{g/C}$**
56. An ammeter, suspected to give inaccurate reading, is connected in series with a silver voltmeter. The meter indicates 0.54 A. A steady current passed for 1 hour deposits 2.0124 g of silver. If the E.C.E. of silver is $1.118 \times 10^{-3} \text{g/C}$, then error in ammeter reading is **+0.04A**
57. A copper voltmeter and a silver voltmeter are connected in series in 4 circuit. The rate of increase in the weights of the cathodes of the two voltmeters will in the ratio of **half the atomic weight of Cu to the atomic weight of Ag**
58. E.C.E of a substance is the mass of the substance liberated at an electrode by the of current in a half a second **2A**

59. A series battery of 12 lead acid accumulators, each of e.m.f 2 V and internal resistance $1/24 \Omega$, is to be charged from 240V dc. If the charging current is not to exceed 3A, what is the value of series resistance required? **71.5 Ω**
60. In the above question, what percentage of energy taken from the mains would be wasted? **90%**
61. A charge of 965C is passed through a silver voltameter. The amount of silver deposited on the cathode is **1.08g**
62. A 6 V storage battery is being charged at the rate of 20 C/s. The power used to charge the battery is **120W**
63. If 100 kWh of energy is consumed at 66V in a copper voltameter, the mass of copper deposited is (E.C.E. of Cu = 0.33×10^{-6} kg/C) **1.8 kg**
64. A car battery has 6 cells in series. What should be the approximate charging voltage? **15v**
65. In order to obtain 100 A for 10 seconds, one would use **lead-acid cell**
66. Assuming the Faraday is 96500 C mol^{-1} and the relative atomic masses of copper and silver are 63 and 108 respectively, the number of Cu^{++} ions and Ag^+ ions liberated by the Faraday is **3×10^{23} ; 6×10^{23}**
67. Ampere hour is the unit of **electric charge**
68. 1 A of current flowing for 25 min through a silver voltameter deposits 1.5 g of silver. The E.C.E. of silver is **0.001g/C**
69. Two electrolytic cells containing solutions of silver and gold salts respectively are connected in series to a dc supply. It is found that by the time 8.3 g of silver (atomic weight 108, valency 1) is deposited on one cell, 5.05 g of gold (atomic weight 197, valency 3) is deposited on another. The amount of charge that has flown during this time is **same and equal to 7420 C**
70. A battery of accumulators of e.m.f. 50 V and internal resistance 2Ω is charged on a 100 V direct current mains. What series resistance will be required to give a charging current of 2 A? **23 Ω**
71. In the above question, what percentage of energy supplied will be wasted in the form of heat? **50%**
72. A lead-acid cell is charged at the rate of 18 A for 10 hours at an average voltage of 2.26 V. It is discharged in the same time at the rate of 17.2 A; the average voltage during discharge being 1.98 V. What is ampere-hour efficiency? **95.5%**
73. In the above question, what is watt-hour efficiency? **83.71%**
74. A copper voltameter is connected such that a steady current flows in a coil of resistance 10Ω for 20 minutes. If copper deposited is 0.99 g and E.C.E. of Cu is 3.3×10^{-4} g/C, the amount of heat developed in the coil is **75000 J**
75. In a copper plating system, an electrolysis current of 3.0 A is used. How many atoms of Cu^{++} are deposited in 1.5 h? **5.6×10^{22}**
76. A lead-acid cell has 13 plates, each 25 cm x 20 cm. The clearance between the neighbouring plates is 1.2 mm. If the resistivity of the acid is $1.6 \Omega \text{ cm}$, find the internal resistance of the cell. **$32 \times 10^{-6} \Omega$**
77. It is desired to charge a 12 V car battery at 6 A from a 230 V d.c. source. The dc. source and battery are connected in series with a group of 60 W, 220 V bulbs in parallel. How many bulbs are required for this purpose? **22**
78. One ampere current flows for one minute through a silver voltameter. It is deposited 0.067 g of silver on the cathode. What is the E.C.E. of silver? **$11.17 \times 10^{-4} \text{ g/C}$**
79. In the above question, how much charge should flow to deposit 108 g of silver? **96700 C**
80. What is the approximate strength of current that will deposit 0.5 g of silver on a spoon in 7.5 minutes? E.C.E. of silver = 11.18×10^{-4} g/C. **1 A**
81. The capacity of a storage battery is rated in **ampere hours**
82. The watt-hour efficiency (η_{wh}) and ampere-hour efficiency (η_{Ah}) are related as **$\eta_{\text{wh}} < \eta_{\text{Ah}}$**

83. The current inside a copper voltameter **is same as outside value.**
84. In a voltameter, the current conduction takes place due to **electrons and ions**
85. In a lead-acid cell, we use multiplate construction **all above**
86. If nearly 10^5 liberate gm equivalent of aluminium, then the amount of aluminium (equivalent weight 9) deposited through electrolysis is in 20 minutes by a current of 50A is **5.4g**
87. The magnitude of the e.m.f of a lead-acid cell depends upon **all above**
88. To liberate one litre of hydrogen at 22.4 atmosphere from acidulated water, the quantity of charge that must be passed through it is **193000 C**
89. A current passing through a copper voltameter deposits 0.602 kg of copper on the cathode in 100 minutes. If there are 10^{25} Copper atoms in one kg of copper, the electric charge delivered to the cathode in one second by Cu^{++} ions will be **1.06 C**
90. The internal resistance of a primary cell is 4. It generates a current of 0.2 A in an external resistance of 21 Ω . The rate at which chemical energy is consumed in providing current in **1Js^{-1}**

Chapter 11 : Alternating Current

1. The A.C system is preferred to D.C system because **a.c voltages can be easily changed in magnitude**
2. In A.C system, we generate sine wave form because **it produce least disturbance in electrical circuit.**
3. **Electroplating** only works on D.C supply.
4. **Crystal** will produce A.C voltage.
5. A coil is rotating in uniform field of an 8 pole generator. In one revolution of the coil, the number of cycles generated by the voltage is **four.**
6. An alternating voltage is given by $v = 20 \sin 157t$. The frequency of alternating voltage is **25 Hz.**
7. An alternating current is given by $i = 10 \sin 314t$. The time taken to generate two cycles of current is **0.04.**
8. An alternating voltage is given by $v = 30 \sin 314t$. The time taken by the voltage to reach -30 V for first time is **0.015 second.**
9. A sine wave is maximum value of 20 V. its value at 135° is **14.14 V.**
10. A sinusoidal current has magnitude of 3 A at 120° . Its maximum value will be **$2\sqrt{3}$.**
11. An alternating current is given by $I = 10 \sin 314t$. Measuring time from $t = 0$, the time taken by the current to reach +10 V for the second time **0.025 seconds.**
12. An A.C generator having 10 poles and running at 600 rpm, will generate an alternating voltage of frequency is **50 Hz.**
13. We have assigned a frequency of 50 Hz to power system because it gives best result when **used for operating both lights and machinery.**
14. An alternating voltage is given by $v = 100 \sin 314t$ volts. Its average value will be **63.7 V.**
15. An alternating current whose average value is 1 A **will produce less** heat than d.c under similar conditions.
16. A sinusoidal alternating current has a maximum value of I_m . Its average value will be **$2 I_m / \pi$.**
17. The area of a sinusoidal wave over a half cycle is **2 x maximum value.**
18. An alternating voltage is given by $v = 200 \sin 314t$. Its r.m.s value is **141.4 V.**
19. The r.m.s value of sinusoidal varying current **is more than** of its average value.
20. Alternating voltages and currents are expressed in r.m.s values because **they give comparison with D.C.**
21. The average value of $\sin^2 \theta$ over a complete cycle is **$1/2$.**
22. The average value of $\sin \theta$ over a complete cycle is **zero.**
23. An alternating current is given by $I = I_m \sin \theta$. The average value of squared wave of this current over a complete cycle is **$I_m^2/2$.**
24. The form factor of sinusoidal wave is **1.11.**
25. The filament of a vacuum tube requires 0.4 A d.c to heat it. The r.m.s value of A.C required is **0.4 A.**
26. A 100 V peak a.c is as effective as **70.7 d.c.**

27. The form factor of square wave is 1.
28. Out of following **triangular wave** is peakiest.
29. The peak factor of sine wave form is 1.414.
30. When a 15-V square is connected across a 50-V a.c voltmeter. It will **read 15 V**.
31. The breakdown voltage of an insulation depend upon **peak value** of alternating voltage.
32. The peak factor of half wave rectifier a.c is 2.
33. The form factor of half wave rectifier a.c is 1.57.
34. When 200 V sinusoidal peak-to-peak is connected across an a.c voltmeter, it will read 141.4.
35. The average value of a sinusoidal current is 100 A. its r.m.s value is 111 A.
36. A current is given by $i = 4 + 2\sqrt{2} \sin 30 + 4\sqrt{2} \sin 50$. The r.m.s value is 6.
37. An alternating voltage or current is a **phasor quantity**.
38. Three parallel circuit take the following currents
 $i_1 = 5 \sin 314t$ $i_2 = 30 \sin (324t + \pi/2)$ $i_3 = 25 \sin (314t - \pi/2)$
 the expression for resultant current is $5\sqrt{2} \sin (\omega t + \pi/4)$.
39. The sum of the following two e.m.f's will be
 $e_1 = 10 \sin \omega t$ $e_2 = 10 \cos \omega t$
is $14.14 \sin (\omega t + \pi/4)$.
40. Ea.ch of the three coils generates an e.m.f of 230 V. The e.m.f of second leads that of the first by 120 degree and the third lags behind the first by same angle. The resultant e.m.f across the series combination 0 V.
41. In a pure resistive circuit, the frequency of power curve is **twice** of that of circuit frequency.
42. In a pure resistive circuit the instantaneous voltage and current are
 $v = 250 \sin 314t$ volts
 $I = 10 \sin 314t$ amperes
 the peak power of circuit is 2500 watt.
 And the average power of the circuit is 1250 watt.
43. An alternating voltage $v = V_m \sin \theta$ is applied to a pure inductive circuit. The current will be $i = I_m \sin (\theta - \pi/2)$.
44. The inductive reactance of a circuit is **directly proportional** to frequency.
45. Power absorbed in a pure circuit is zero because of power factor of the circuit is **zero**.
46. An alternating voltage $v = V_m \sin \theta$ is applied to a pure capacitive circuit. The current will be $i = I_m \sin (\theta + \pi/2)$.
47. The capacitive reactance of a circuit is **inversely directly proportional** to frequency.
48. 58.4 V will be instantaneous output of a generator at 20 electrical degree if its output is 170 V at 90 electrical degrees.
49. 339 V will be peak to peak voltage for 120 V.
50. A 500 V sine wave generator appears across a 10 k ohm resistor. 40.6 mA is instantaneous current in resistor at phase angle of 35 degree.

51. The instantaneous value of $55 \sin (2\pi \times 16t)$ mA at $t = 1/32$ second is **0 mA**.
52. Find the average value of $v(t) = 6 + 2 \sin (2\pi \times 100t)$ volts is **6 V**.
53. The instantaneous value of $i(t) = 16 \sin (2\pi \times 18 \times 10^4 t - 15^\circ)$ mA at $t = 2$ microsecond is **14.55 mA**.
54. The average value of 2 A d.c current is **2 A**.
55. The effective value of 2 A d.c current is **2 A**.
56. The voltage across a 0.5 μ F capacitor is $v(t) = 16 \sin (2 \times 10^3 t)$ V. the capacitive reactance of the capacitor is **1 k ohm**.
57. The a.c current through a 20 μ F capacitor is $i(t) = 3 \sin (800t)$ A. the peak voltage across the capacitor is **185.7 V**.
58. The current in a 2.2 k ohm resistor is $i(t) = 5 \sin (2\pi \times 100t + 45^\circ)$ mA. The instantaneous value of resistor voltage at $t = 0.4$ millisecond is **9.47 V**.
59. The e.m.f is given by $e = 8 \sin \omega t + 6 \sin 2\omega t$ volts. The r.m.s value is **7.07 V**.
60. A current is made up of two components viz 3 A d.c components and a.c components given by $i = 4 \sin \omega t$. The average value of current is **4 A**.
61. A current is made up of two components viz 3 A d.c components and a.c components given by $i = 4 \sin \omega t$. The r.m.s value of current is **$\sqrt{17}$ A**.
62. A hot wire ammeter reads 10 A in an a.c circuit containing 10 ohm. The peak value of voltage across the resistor is **141.4 V**.
63. An alternating current is converted in direct current by **rectifier**.
64. A capacitor is perfect insulator for **direct current**.
65. In an a.c circuit electrical energy is consumed in **R**.
66. The r.m.s value of current given by $i = 10 + 5 \sin (628t + 20^\circ)$ A is **$15\sqrt{2}$ A**.
67. The potential difference V across and current I flowing through instrument in an a.c circuit are given by
 $v = 5 \cos \omega t$ volts
 $I = 2 \sin \omega t$ amperes
the power dissipated in the instrument is **0 W**.
68. An inductor of negligible resistance whose reactance is 22 ohm at 200 Hz is connected to a 200 V, 50 Hz power line. The value of inductance is **0.0175 H**.
69. An alternating voltage $v = 200\sqrt{2} \sin 100t$ is connected to a 1 μ F capacitor through an a.c ammeter. The reading of the ammeter shall be **20 mA**.
70. A 40 ohm electric heater is connected to a 200 V, 50 Hz supply. The peak value of electric current in the circuit is approximately **7 A**.
71. Using an a.c voltmeter, the potential difference in the electrical line in a house is read to be 234 V. if the line frequency is known to be 50 Hz, the equation for line voltage will be **$v = 331 \sin 100\pi t$** .
72. If the instantaneous current in an a.c circuit is $i = 2 \cos (\omega t + \theta)$ amperes, the r.m.s value of current is **$\sqrt{2}$** .
73. If the angular speed at rotation of an armature of alternating current generator is double, then the induce e.m.f will be **twice**.
74. In an a.c circuit, the current is given by $i = 100 \sin 200\pi t$ amperes. The time taken by the current to reach peak value from zero is **1/400 sec**.

75. A choke is preferred to a resistance for limiting current in a.c circuit because **there is no wastage of energy.**
76. If an alternating current of 50 Hz is flowing in circuit, the current becomes zero **100 times.**
77. A current of 5 mA flows in a resistance less choke from 220 V alternating source. The energy consumed in the choke is **Zero (0) J.**
78. If a phasor points straight down, its angle can be given as 270° OR **-90° .**
79. An alternating current flows through a resistor of resistance R. if peak value of current is I_p , the power dissipated is **$\frac{1}{2} I_p^2 R$.**
80. The inductive reactance of an inductor in a d.c is **Zero.**
81. The time period of direct current is **infinite.**
82. An electric bulb rated at 220 V is connected to 220 V 50 Hz a.c source. Then the **bulb glows intermittently.**
83. The peak- to-peak alternating potential difference across a 150 ohm resistor is 339 V. The r.m.s current is the resistor is **0.8 A**
84. An a.c source is 120 V, 60 Hz. The value of voltage after $1/720$ sec from start **84.8 V.**
85. The frequency of d.c line in India is **50 Hz.**
86. The reactance of a capacitor at 50 Hz is 5 ohm. If the frequency to 100 Hz, the new reactance is **2.5 ohm.**
87. A choke coil is a coil having **low inductance and high resistance.**
88. A pure inductor is connected to an alternating voltage source. If both the voltage and the frequency are double, the circuit current **no change.**
89. The voltage across a 0.01 μ F capacitor is $v = 240 \sin (1.25 \times 10^6 t - 30^\circ)$. The peak current in the circuit is **0.03 A.**
90. The voltage across an inductor is $v = V_m \sin (\omega t - 30^\circ)$. The current through the inductor is $i = I_m \sin (\omega t - \theta)$. The value of θ is **120° .**
91. An alternating current varies through complete one cycle in 1 μ s. Its frequency is **10^6 .**
92. An alternating current cannot be measured by a d.c ammeter because **average value of a cover one cycle is zero.**
93. The purpose of choke in a fluorescent tube is **to increase the voltage momentarily.**
94. An a.c of frequency f is flowing in a circuit containing only a choke coil L. if V_m and I_m represents the peak values of voltage and current respectively, the average power supplied by source is **Zero.**
95. In comparison with d.c transmission line losses in a.c transmission line are high.
96. In an a.c circuit, the instantaneous current and voltage are represented as $i = I_m \sin (\omega t - \pi/6)$ and $v = V_m \sin (\omega t + \pi/3)$. The voltage lead the current by **$\pi/2$.**
97. An air core choke coil and an electric bulb are connected in series with a.c mains. On introducing soft iron bar in the coil, the intensity of light will be **decrease.**
98. The reactance of 1 F capacitance when connected to a d.c circuit is **infinite.**

99. The main supply of a house is 230 V, 50 Hz. The potential difference experienced by a person who happens to touch the line is **325 V.**
100. Radio frequency choke is **air cooled.**
101. A 40 ohm resistor is connected across a 15 V variable frequency source. The current through the resistor when frequency is 100 Hz is **0.375 A.**

Chapter #12

Series AC Circuit

The impedance of an R-L series circuit is given by $\sqrt{R^2 + X_L^2}$.

In an R-L series circuit, line current lags behind the applied voltage

In an R-L series circuit, the phase difference Φ between applied voltage and circuit current will increase if X_L is increase.

The power consumed in an AC circuit is $V_m I_m / 2 \cdot \cos \Phi$

The power factor of an AC circuit is given by **R/Z**

For greater accuracy, the value of Φ should be determined from **$\tan \Phi$**

The power factor of DC circuit is **1 Unity**.

As the power factor of a circuit is increased **Reactive power is decreased**

The active and reactive component of line current of an inductive circuit is equal. The power factor of the circuit is **0.707 lagging**

The active and apparent powers of an AC circuit are equal in magnitude. The circuit power factor is **Unity 1**.

A wattmeter indicates **Active power**

If the lagging reactive power of an AC circuit increases, the power factor of the circuit **is decreased**.

Reactive power in an AC circuit is **A liability on the circuit**.

In an R-L series circuit, the two sides of the impedance triangle that form the phase angle are **R and Z**

Impedance of an AC circuit is a **Scalar quantity**.

A low power factor of the circuit means that it will draw more **Reactive power**.

In an R-L-C series circuit, the frequency is below the resonant frequency, then **$X_C > X_L$**

At series resonance, the voltage across L or C is **much more than applied voltage**.

The Q factor of a coil is **Inversely proportional** to the resistance of coil.

At parallel resonance, **power factor is unity**.

A series resonant circuit magnifies **voltage**.

When the supply frequency is less than the resonant frequency in a parallel AC circuit, then circuit is **inductive**.

Dynamic impedance of a parallel tuned circuit is **L/CR** .

A parallel resonant circuit magnifies **current**.

When the supply frequency is more than the resonant frequency in a parallel AC circuit, the circuit is Capacitive and current is **90**.

Wattless current is said to flow when the phase angle between voltage

With the increase in frequency of an AC, the impedance of R-L-C series circuit **first decrease, becomes minimum and then increase**

Power factor of a circuit can be improved by the use of **Capacitor**.

In an R-L-C series circuit, the current through resistance and inductance has a phase difference of **0**.

A resistor R is connected across a variable frequency AC source. The graph between R and frequency F will be **Straight line parallel to frequency axis**.

A pure inductor is connected to a variable frequency AC source. The graph between inductive reactance and frequency will be **Straight line passing through origin**.

A pure capacitor is connected to a variable frequency AC source. The graph between capacitive reactance and frequency will be **A hyperbola**.

In R-L-C series AC circuit, the inductive reactance is equal to a capacitive reactance, the phase angle between applied voltage and circuit current is **0**.

L, C and R represent the physical quantities inductance, capacitance and resistance respectively. The combination which has the dimension of frequency are **$1/\sqrt{LC}$** .

The current in a circuit is wattless if **Resistance in the circuit is zero**.

A 60% lagging power factor implies that the load is **inductive**.

CHAPTER# 13 MCQS VK MEHTA

1. When a phasor is multiplied by $-j$, it is rotated through 270° In the counter-clockwise direction.
2. The value of j^5 is equal to $\sqrt{-1}$.
3. When a Phasor is multiplied by j^6 it is rotated through 540° in counterclockwise direction .
4. If a phasor is multiplied by j , then **only its direction changes**.
5. In the complex number $4+j7$, 7 is called the **quadrature**.
6. The reciprocal of a complex number results in a **complex number**.
7. Rationalising the denominator of a complex number eliminates **j component in the denominator**.
8. If two complex number are equal, then **their in-phase and quadrature components will be separately equal**.
9. A phasor $2\angle 180^\circ$ can be expressed as **-2**.
10. A current of $3+j4$ amperes is flowing through a circuit. The magnitude of current is **5A**.
11. A complex number is given by $a+jb$. The magnitude of this complex number will be **less than 1.414* whichever is the greater a or b**.
12. The voltage applied in a circuit is given by $100\angle 60^\circ$ volts . It can be written as **$100\angle -300^\circ$ volts**.
13. The phasor $8\angle 60^\circ$ is identical to **$8\angle 780^\circ$**
14. For addition or subtraction of phasors, we use **Rectangular** form.
15. The quantity $2+j2$ can be expressed in the polar form as **$2\sqrt{2}\angle 45^\circ$** .
16. For multiplication or division of phasors, we use **Polar** form.
17. If the impedance of an A.C Circuit is $10\angle 60^\circ \Omega$, then resistance in the circuit is **5 Ω** .
18. The conjugate of $-4+j3$ is **$-4-j3$** .
19. The conjugate of $10\angle -40^\circ$ is **$10\angle 40^\circ$**
20. The sum of two conjugate number results in **in-phase component only**.
21. The difference of two conjugate numbers results in **quadrature component only**
22. When two conjugate numbers are multiplied, the result is **no quadrature component**
23. The value of $5\angle 40^\circ * 3\angle 20^\circ$ is **$15\angle 60^\circ$**
24. The value of $9\angle 30^\circ / 3\angle 10^\circ$ is **$3\angle 20^\circ$**
25. The square root of $64\angle 36^\circ$ is **$8\angle 18^\circ$**

26. The cube root of $8\angle 30^\circ$ is $2\angle 10^\circ$
27. The kVA drawn by an a.c circuit is given by $(3+j4)$ kVA. The active power drawn by the circuit is **3KW**.
28. The impedance of an a.c circuit is $45\angle -30^\circ \Omega$. The circuit will be **capacitive**
29. In an a.c circuit, the apparent power in the complex form is equal to **phasor voltage * conjugate of phasor current**.
30. A series a.c circuit has $R=4 \Omega$ and $X_L=3 \Omega$. It will be expressed in the rectangular form as **$4+j3$** .
31. The two complex numbers are given as : $5(\cos 30^\circ + j \sin 30^\circ)$; $10(\cos 15^\circ + j \sin 15^\circ)$. The value of product of these two numbers is equal to **$50(\cos 45^\circ + j \sin 30^\circ)$**
32. The voltage & current in an a.c series circuit are $230\angle 0^\circ$ volts and $100\angle 30^\circ$ A respectively. The circuit will be **capacitive**.
33. The value of $10\angle 60^\circ * 2\angle 20^\circ / 5\angle 40^\circ$ will be **$4\angle 40^\circ$** .
34. The current through a 4H inductor is $i=0.6 \sin (100t-10^\circ)$ A. Using phasor algebra, voltage across the inductor is **$240\angle 80^\circ$** .
35. The polar form of following waveform is

$$V_1=16\sin(\omega t + 35^\circ)\text{V}$$

$$V_2=32\sin(\omega t - 55^\circ)$$

$$\mathbf{V_1=16\angle 35^\circ \text{ V}; V_2=32\angle -55^\circ \text{ V}}$$

36. The current through a 400Ω resistor is $i=0.06\sin (\omega t-30^\circ)$ A. The voltage across the resistor is **$24\angle -30^\circ \text{ V}$**
37. The reciprocal of $12-j16$ in polar form is **$0.05\angle 53.13^\circ$** .
38. The reciprocal of j is **$-j$** .
39. In fig 13.17 $R=300 \Omega$, $L =0.2\text{H}$ & $v=17 \sin (2000 t)$ volts. The total equivalent impedance in rectangular form is

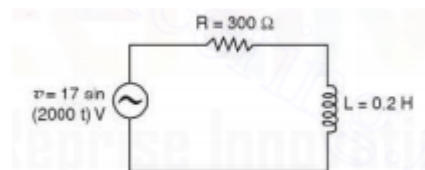


Fig 13.17

$$\mathbf{(300+j400) \Omega}$$

40. In the above question , what is the equivalent impedance in polar form? $500 \angle 53.13^\circ \Omega$
41. In the polar form capacitive reactance will be written as $1/\omega C \angle -90^\circ$.
42. In rectangular form capacitive reactance will be written as $-j/\omega C$.
43. In polar form, capacitive susceptance will be written as $\omega C \angle 90^\circ$.
44. In rectangular form, capacitive susceptance will be written as $j\omega C$.
45. In polar form, inductive susceptance will be written as $1/\omega L \angle -90^\circ$.
46. In rectangular form, inductive susceptance will be written as $-j/\omega L$.
47. In polar form, conductance will be written as $1/R \angle 0^\circ$.
48. In rectangular form, conductance will be written as $1/R + j0$.
49. The impedance of the network shown in Fig in rectangular form is $(90 + j120) \Omega$.
50. In the above question, the network impedance in polar form is $150 \angle 53.13^\circ \Omega$

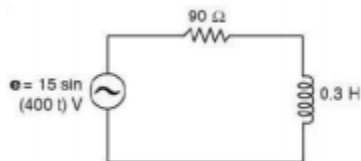


Fig 13.18

51. What is the sinusoidal expression for current in the circuit shown in Fig 13.19?

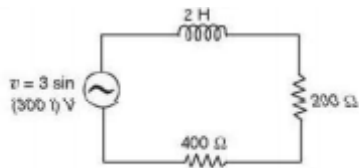


Fig 13.19

$3.54 \sin(300t - 45^\circ) \text{ mA}$

52. For the circuit shown in Fig the current i in polar form is

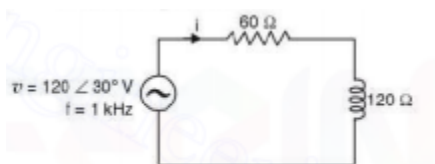


Fig 13.20

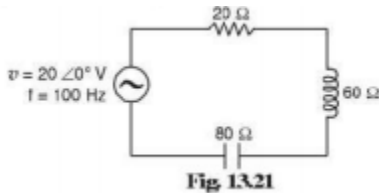
$0.26 \angle -43^\circ \text{ A}$.

53. In the above question, current I in sinusoidal form is $i=0.895 \sin(2\pi * 10^3t-33.43^\circ)\text{A}$

54. In fig 13.20 , the voltage v_r across the resistor in polar form is $53.7\angle-33.43^\circ\text{V}$.

55. In the fig.13.20 , the magnitude of the circuit impedance is 134.16Ω

56. In the circuit shown in fig 13.21 , the total impedance in polar form is



$28.28\angle-45^\circ \Omega$

57. In the above question, the circuit current in the polar form is $0.707\angle45^\circ\text{A}$.

58. In Fig 13.21 , the frequency of the circuit current in polar form is 100Hz .

59. In the fig 13.21, the voltage v_r across the resistor is $14.14\angle45^\circ\text{V}$.

60. In the circuit shown in fig 13.21 is made to resonate, the magnitude of circuit current will be $1\angle0^\circ\text{A}$.

61. The capacitive susceptance of a $5\mu\text{F}$ capacitor 16kHz in polar form is $0.503\angle90^\circ$ siemens.

62. In the above question, the capacitive susceptance in the rectangular form is $0+j0.503$ siemens

63. The capacitive susceptance of a $0.01 \mu\text{F}$ capacitor at d.c is zero.

64. The conductance of a 5Ω resistor in polar form is $0.2\angle0^\circ$ siemens

65. The capacitive susceptance of a $0.2 \mu\text{F}$ capacitor at $\omega=1.25*10^6$ rad/s is $0.25\angle90^\circ$ siemens.

66. A current of $(120-j50)$ A flows through a circuit when the applied voltage is $(8+j2)$ V . What is the magnitude of circuit impedance ? 0.0635Ω

67. In the above question, what is the power factor of the circuit? 0.803 lagging .

68. In question 66, what is the reactive power? 639.75VAR

69. In an R-L series circuit , $R=10 \Omega$; $X_L=8.66 \Omega$. If current in the circuit is $(5-j10)\text{A}$, the applied voltage in polar form is $148\angle-22.53^\circ \text{V}$

70. In the above problem, circuit power factor is 0.756 lag.

71. In question 69, what is the power consumed in the circuit? 1250.66W

72. The impedance of ac circuit is $45\angle-30^\circ \Omega$. The current phase angle is? 30° .

73. An R-L series circuit is connected to a voltage of $v=566 \sin 314t\text{V}$. The circuit current is $i=4 \sin(314t- \pi/4)\text{A}$. What is the value of resistance ? 100Ω

74. In the above question, the value of inductance is **0.318H**
75. If the potential drop across a circuit be represented by $(40+j25)V$ with reference to circuit by $(40+j25)V$ with reference to circuit current & power absorbed by the circuit is 160W, the complex expression for impedance is **$11.8\angle 32^\circ \Omega$**
76. In the above question, What is the circuit power factor? **0.848 lag**
77. In the circuit shown in Fig 13.22, the circuit current in polar form is

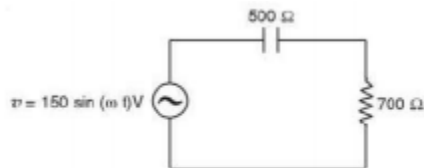


Fig 13.22

$0.174\angle 35.54^\circ \text{ A}$

78. In the above question, the circuit current in the sinusoidal form is **$0.174 \sin(\omega t + 35.54^\circ) \text{ A}$** .
79. In the Fig 13.22 , the voltage v_R across the resistor is **$121.8\angle 35.54^\circ \text{ V}$**
80. In Fig. 13.22 , the voltage v_C across the capacitor is **$92.2\angle -36.8^\circ \text{ V}$**

VK Metha Chapter # 14

1. Domestic appliances are connected in parallel across a.c. mains because **the operation of each appliance becomes independent of the other.**
2. When a parallel a.c. circuit contains a number of branches, then it is convenient to solve the circuit by **phasor algebra.**
3. The power taken by the circuit shown in Fig. 14.28 is **1920 W.**

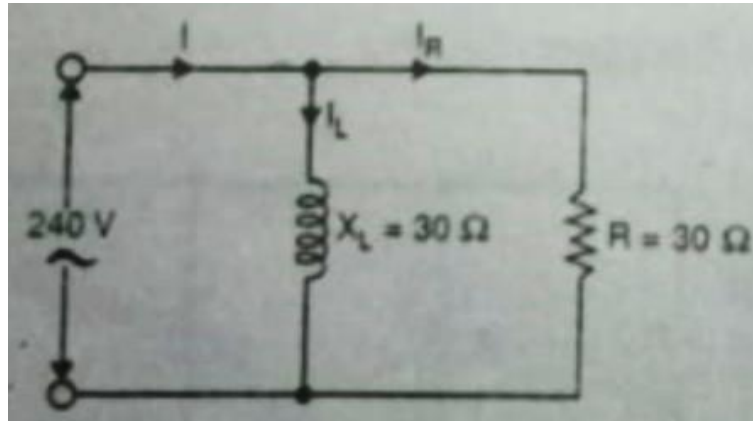


Fig. 14.28

4. The active component of line current in Fig. 14.28 is **8A.**
5. The power factor of the circuit shown in Fig. 14.28 is **0.707 lagging.**
6. The total line current drawn by the circuit shown in Fig. 14.28 is **$8\sqrt{2}$ A.**
7. The power consumed in the circuit shown in Fig. 14.29 is **960 W.**

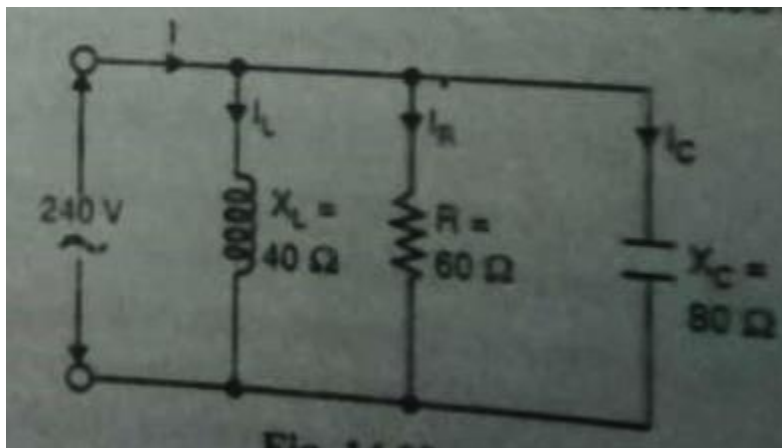


Fig. 14.29

8. The active component of line current in Fig. 14.29 is **4A**.
9. The line current is drawn by the circuit shown in Fig. 14.29 is **5A**.
10. The power factor of the circuit shown in Fig. 14.29 is **0.8**.
11. The impedance of the circuit shown in Fig. 14.29 is **48 ohms**.
12. The circuit shown in Fig. 14.29 is **inductive**.
13. If in Fig. 14.29, X_L is made equal to X_C then line current will be **4A**.
14. The power consumed in the circuit shown in Fig. 14.30 is: **None of the above**.

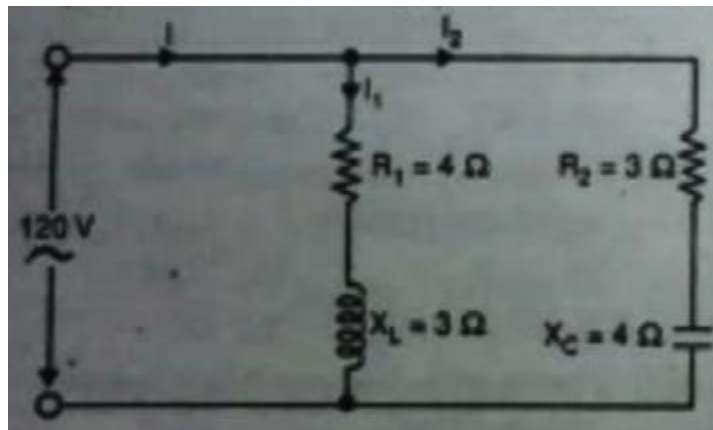


Fig. 14.30

15. If the circuit shown in Fig. 14.30 is connected to 120 V d.c., the current drawn by the circuit is **30A**.
16. The circuit shown in Fig. 14.30 is **capacitive**.
17. If the source frequency in Fig. 14.31 is low, then, **coil takes a high lagging current**.

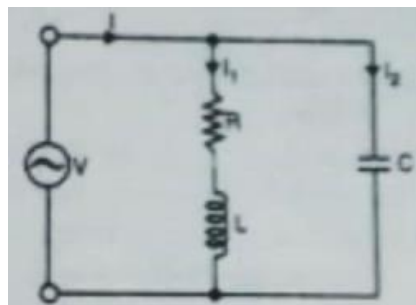


Fig. 14.31

18. If the source frequency in Fig. 14.31 is high then, **capacitor takes a high leading current.**
19. The circuit shown in Fig. 14.31 will be in resonance when, **V and I are in phase.**
20. The circuit shown in Fig 14.32 is **capacitive.**

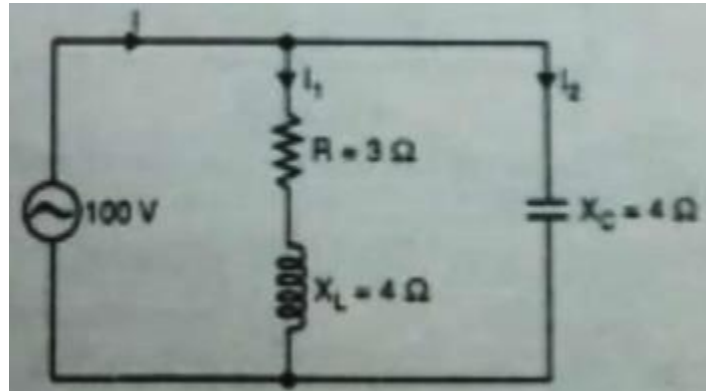


Fig. 14. 32

21. The circuit shown in Fig. 14.32 will consume a power of **1200 W.**
22. If the admittance of a parallel a.c. circuit is increased, the circuit current is **increased.**
23. The admittance of the circuit shown in Fig 14.33 is **0.1 S.**

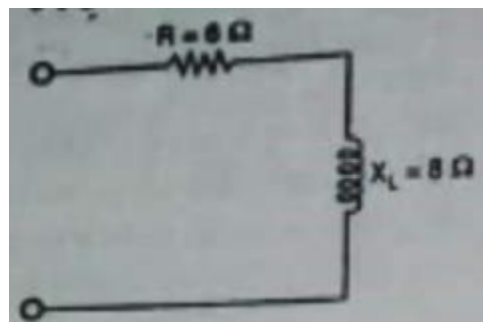


Fig. 14.33

24. The conductance of the circuit shown in Fig.14.33 is **0.06 S.**
25. The inductive susceptance of the circuit shown in Fig. 14.33 is **0.08 S.**
26. The circuit shown in Fig. 14.34 is **inductive.**

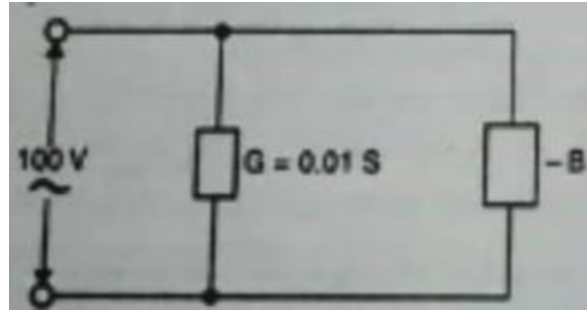


Fig. 14.34

27. The power loss in the circuit shown in Fig.14.34 is **100 W**.
28. The conductance and susceptance components of admittance are **parallel elements**.
29. The impedance of a circuit is 10 ohms. If the inductive susceptance is 1 S, then inductive reactance of the circuit is **100 Ω**.
30. The conductance and inductive susceptance of a circuit have the same magnitude. The power factor of circuit is **0.5**.
31. The admittance of a circuit is $(0-1 + j 0.8)$ S. The circuit is **capacitive**.
32. In a parallel a.c circuit, power loss is due to **conductance alone**.
33. The admittance of a parallel circuit is $0.12 \angle -30^\circ$ S. The circuit is **inductive**.
34. A circuit has an impedance of $(1 - j 2)$ Ω. The susceptance of the circuit is **0.4 S**.
35. A circuit has admittance of 0.1 S and conductance of 0.08 S. The power factor of the circuit is **0.8**.
36. At parallel resonance, the circuit offers impedance equal to **L/CR** .
37. The impedance at parallel resonance is very large because **ratio L/C is very large**.
38. The Q-factor of a parallel resonant circuit is given by **$1/R \sqrt{L/C}$** .
39. In a parallel a.c. circuit, if the supply frequency is more than the resonant frequency, then the circuit is **capacitive**.
40. A parallel resonant circuit magnifies **current**.

41. In a parallel a.c. circuit, if the supply frequency is less than the resonant frequency, then the circuit is **inductive**.
42. At parallel resonance, the circuit draws a current of 2 mA. If the Q-factor of the circuit is 100, then current through the capacitor is **200 mA**.
43. The Q-factor of a parallel tuned circuit can be increased by **decreasing circuit resistance**.
44. If a parallel resonant circuit is shunted by a resistance, then **circuit impedance is decreased**.
45. If the resistance in the inductive branch of a parallel resonant circuit is increased, then **impedance of the circuit is decreased**.
46. In the circuit shown in Fig. 14.35, if $X_C > R$ then the phase angle ϕ is **$\phi < 45^\circ$** .

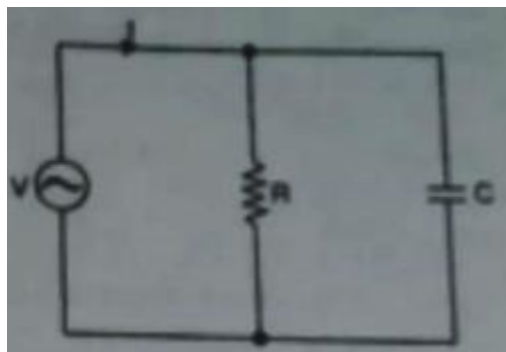


Fig. 14.35

47. For the circuit shown in Fig. 14.35, **it is not possible to draw impedance triangle**.
48. For the circuit shown in Fig. 14.35, the circuit impedance Z will be **always less than X_C or R** .
49. In the circuit shown in Fig. 14.35. the magnitude of impedance is **$R X_C / \sqrt{R^2 + X_C^2}$** .
50. In a parallel RC circuit with $R > X$ the phase angle will be greater than **45°** .
51. In the circuit shown in Fig. 14.36, the applied voltage is **10 V**.

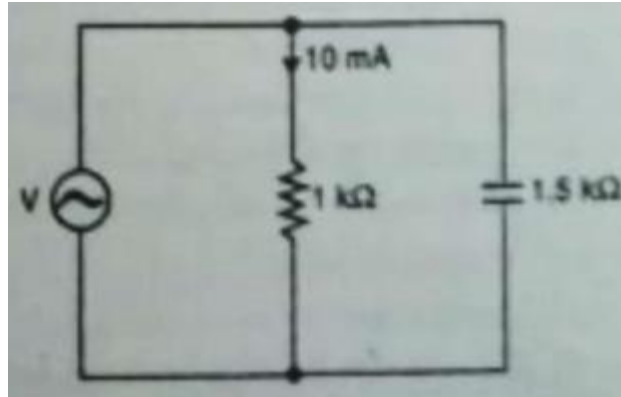


Fig. 14.36

52. In fig. 14.36, the circuit impedance is **832 Ω**.
53. In fig. 14.36, the power dissipated in the circuit is **0.1 W**.
54. In a parallel RC circuit, the phase angle is **$\text{Cos}^{-1} Z/R$** .
55. In the circuit shown in Fig. 14.37, circuit impedance is **less than R or X_L** .

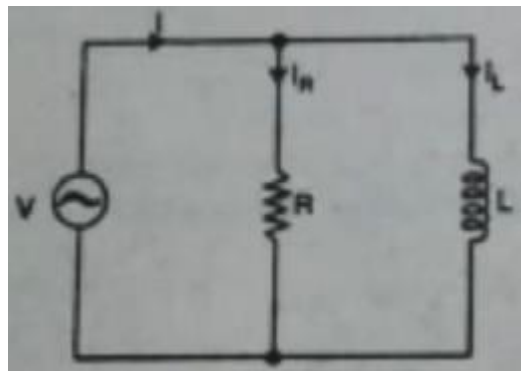


Fig. 14.37

56. In Fig. 14.37, if $R < X_L$, then phase angle will be **less than 45°**.
57. In Fig. 14.37, the line current I is **greater than I_R or I_L** .
58. In Fig. 14.37, if frequency of voltage source is increased, the phase angle will **decrease**.
59. In Fig. 14.37, if supply frequency is decreased, the circuit power factor will **decrease**.
60. In the circuit shown in Fig. 14.37, the magnitude of circuit impedance is **$\frac{R X_L}{\sqrt{R^2 + X_L^2}}$** .

61. In the circuit shown in Fig. 14.38, the circuit impedance is **6k Ω** .

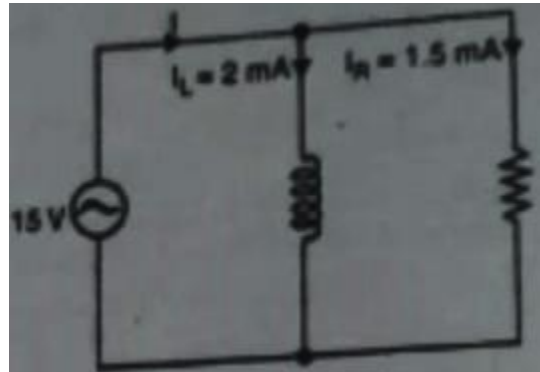


Fig. 14.38

62. In Fig. 14.38, the circuit power factor is **0.61**.

63. If the supply frequency in Fig. 14.38 is increased, the circuit power factor will **increase**.

64. In Fig. 14.38, the circuit current I **leads** I_L .

65. In Fig. 14.38, the circuit current I **lags** I_R .

66. In the circuit shown in Fig. 14.39, the line current I **lags** I_C .

67. In the circuit shown in Fig. 14.39, the line current I **leads** I_R .

68. If the supply frequency of the circuit in Fig. 14.39 is increased, the circuit power factor **decreases**.

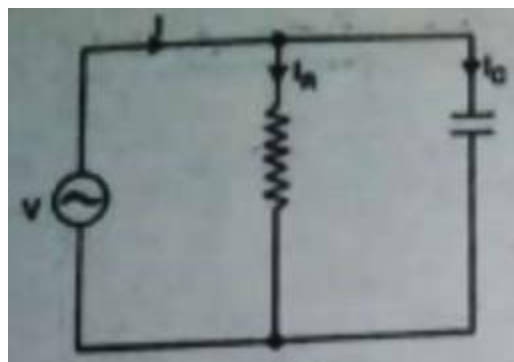


Fig. 14.39

69. In the circuit shown in Fig. 14.40, the current and I are **180° out of phase**.

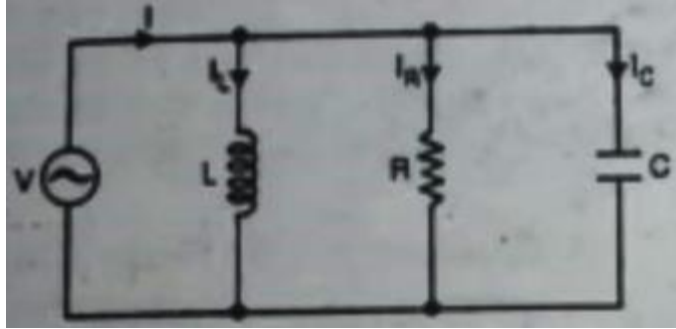


Fig. 14.40

70. In the circuit shown in Fig. 14.40 if $X > X_C$, then circuit current **will lead the applied voltage V**.

71. At resonance, the line current/in Fig. 14.40 is equal to I_R .

72. In Fig. 14.40, except at resonance, the circuit impedance Z is **less than R**.

73. In Fig. 14.40 if $X_L > X_C$ increasing the supply frequency will cause phase angle to **increase**.

74. At resonance, the angle between V and I in Fig. 14.40 is 0° .

75. In Fig. 14.40, the resonant frequency, is $1 / 2\pi \sqrt{LC}$.

76. At resonance, the LC combination in Fig. 14.40 offers **infinite impedance**.

77. The magnitude of impedance of the circuit shown in Fig. 14.41 is $R X_L X_C / \sqrt{(R X_L - R X_C)^2 + X_L^2 X_C^2}$.

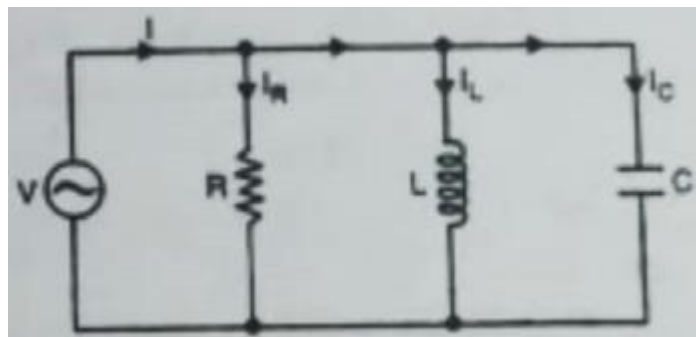


Fig. 14.41

78. In the circuit shown in Fig. 14.41, when $I_L = 36 \text{ mA}$ and circuit current $I = 1.2 \text{ mA}$, the Q in circuit is **30**.

79. In Fig. 14.41, if $Q = 40$, $R = 20\text{k}$ and $V = 60 \text{ V}$, then, I_C is **120 mA**.

80. If the circuit shown in Fig. 14.41 is operated above its resonant frequency, the circuit behaves as **capacitive circuit**.

81. If the circuit shown in Fig. 14.41 is operated Below the resonant frequency, the circuit behave as **inductive circuit**.

82. In the circuit shown in Fig. 14.42, if Q of be coil is 5, the phase angle between V and I_L is **79°**.

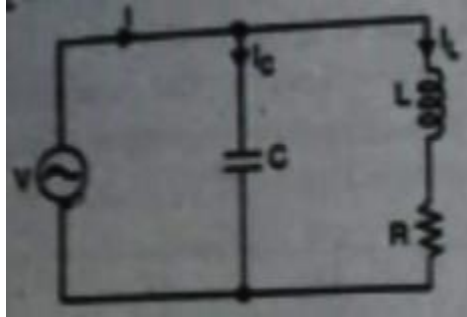


Fig. 14.42

83. In the circuit shown in Fig 14.42, if $I_L = I_C$, the circuit will be **capacitive**.

84. In the circuit shown in Fig. 14.42, at resonance $I_L > I_C$.

85. In the circuit shown in Fig. 14.42, if $Q = 10$, the angle between I_L and V is **84°**.

86. In the circuit shown in Fig. 14.42, what will be the Q of the inductor with $R = 50 \Omega$; $L = 20 \text{ mH}$ and $f = 15 \text{ kHz}$? **37.7**

87. In the above question, what is the circuit Q? **37.7**

88. In the circuit shown in Fig 14.43, what is the resonant frequency in rad/s? **12500 rad/s**.

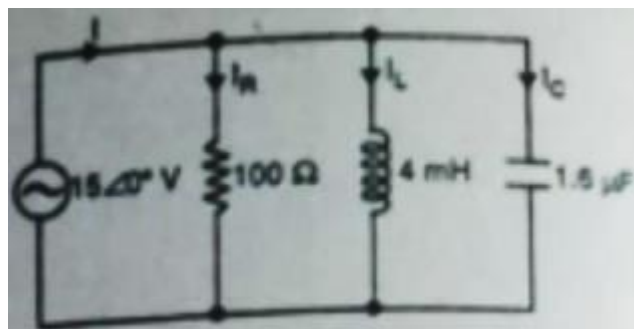


Fig. 14.43

89. In the above question, what is the polar form of line current at resonance? **$0.15 < 0^\circ$ A.**

90. In Fig. 14.43, what is the polar form of resonance? **$0.3 < -90^\circ$ A.**

91. If the resonant frequency of the circuit shown in Fig. 14.43 is f_r , then circuit impedance at a frequency other than f_r , will be **smaller than at f_r .**

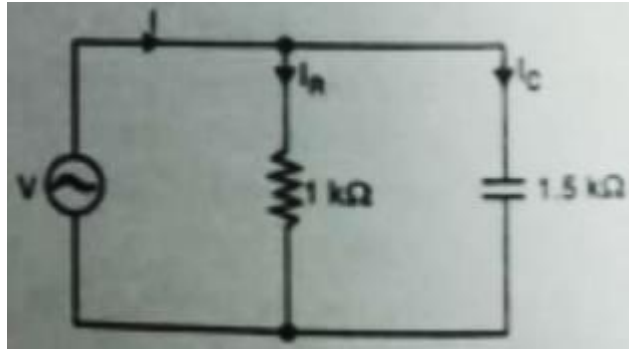


Fig. 14.44

92. In the circuit shown in Fig. 14.44, the total circuit impedance is **832Ω .**

93. In the circuit shown in Fig. 14.44, the phase angle between applied voltage V and circuit current I is less than **45° .**

94. In the circuit shown in Fig. 14.45, the total circuit impedance is **$6 \text{ k} \Omega$.**

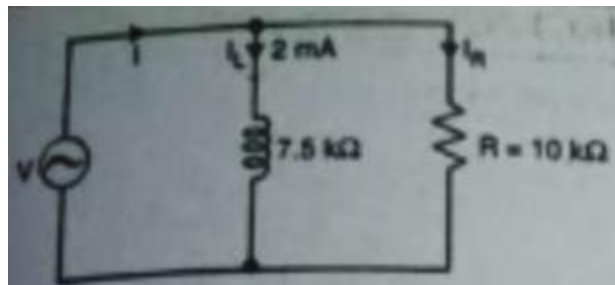


Fig. 14.45

95. In the circuit shown in Fig. 14.45, what is the line current I? **2.5 mA .**

96. In the circuit shown in Fig. 14.45, the line current is **less than the arithmetic sum of $I_R + I_L$.**

97. In a parallel RL circuit. $I_R = 20 \text{ mA}$ and line current $I = 18 \text{ mA}$. The statement is **incorrect**.

98. When it is not appropriate to use the formula $f_r = 1/2\pi \sqrt{LC}$ for a practical parallel LC circuit? **When Q of inductor is less than 10.**

99. In a practical parallel resonant circuit, $I_L > I_C$.

100. In a parallel resonant LC circuit, the line current is **much less than I_L or I_C** .

Chapter 15

1. In a two phase generator the electrical displacement between the two phases or windings is **90** electrical degrees.
2. In a six phase generator the electrical displacement between different phases or windings is **60** electrical degrees.
3. The torque on the rotor of three phase motor is more constant than that of single phases motor because of **3- phase power is of constant value**.
4. For the same rating size of 3-phase motor will be **less than that of** single phase motor.
5. To transmit the same amount of power over a fixed distance at given voltage, the 3 phase system requires **3/4 th times** the weight of copper.
6. The phase sequence of 3 phase system is RYB. The other possible phase sequence can be **RBV**.
7. If in fig below the phase sequence is RYB then **L1 will burn more brightly than L2**.

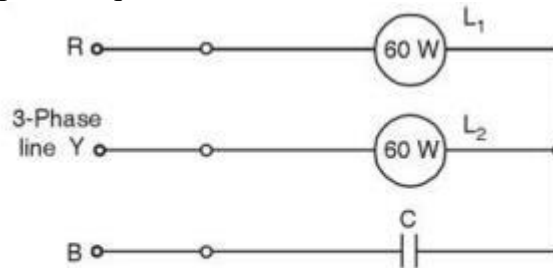
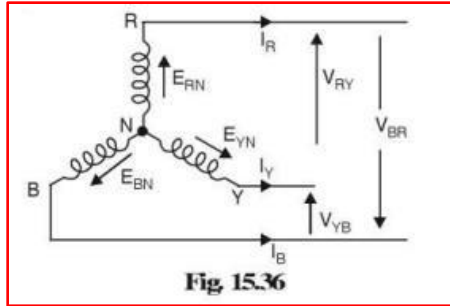


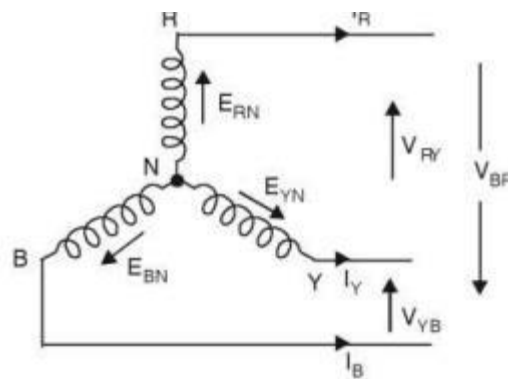
Fig 15.35

8. If the phase sequence of 3-phase line in above fig is reversed then **L2 will be brighter than L1**.
9. The advantage of star connected supply system is that **two voltages can be used**.
10. In a balanced star connected system, line voltages are **30°** a head of their respective phase voltages.
11. In a star connected system, the relation between line voltage V_L and phase voltage V_{ph} is

$$\underline{V_L V_L = \sqrt{3} V_{ph}}$$



12. Fig. 15.36 shows a balanced star connected system, the line voltage V_{RY} given by $V_{RY} = E_{RN} - E_{YN}$.
13. If the load connected to 3-phase generator shown in fig 15.36 has a lagging P.F of $\cos \phi$, then phase angle between V_{RY} and I_R is $30^\circ + \phi$.
14. Voltage $V_{CD} = 48 \angle 30^\circ$ V, V_{DC} will be $48 \angle -150^\circ$.
15. In a 3-phase system, if the instantaneous values of phases R and Y are +60 V and -40 V respectively, then instantaneous voltage of phase B is **-20 V**.
16. In a 3-phase system, $V_{YN} = 100 \angle -120^\circ$ V and $V_{BN} = 100 \angle 120^\circ$ V, V_{YB} will be **$173 \angle -90^\circ$** V.
17. In the above question V_{YB} lead V_{YN} .
18. In question 16, phase angle between V_{YB} and V_{YN} is **30°** .
19. Voltage $V_{EC} = 15 \angle 0^\circ$ V and $V_{Ff} = 12 \angle 180^\circ$ V, These voltages are connected in series with e connected to f. V_{EF} will be **$27 \angle 180^\circ$** V.
20. The algebraic sum of instantaneous phase voltages in 3-phase circuit is equal to **Zero**.



21. If the load connected to the 3-phase generator shown in Fig. 15.37 has a leading P.F of $\cos \phi$ then angle between V_{RY} and I_R is $30^\circ - \phi$.

22. Each phase voltage in Fig. 15.37 is 230 V. If connections of phase B are reversed then, **$V_{RY} > 230 \text{ V}$.**
23. The power delivered by 3-phase system shown in Fig. 15.37 is $\sqrt{3}V_L I_L \cos \Phi$, here Φ is phase difference between **phase voltage and corresponding phase current.**
24. A 3-phase load is balanced if all three phases have **same impedance and PF.**
25. Three 50 ohm resistors are connected in star across 400 V, 3 phase supply. If one of the resistors is disconnected, then line current will be **4 A.**

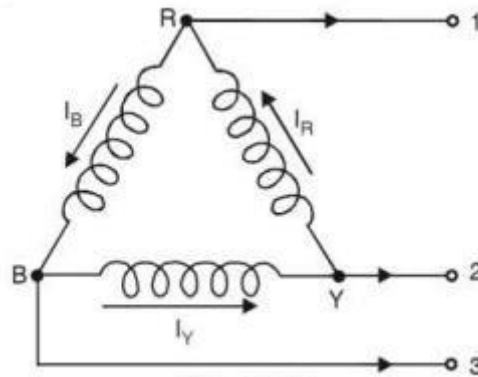


Fig 15.38

26. Fig 15.38 shows balanced delta connected supply system, the current in line 1 is **$I_R - I_B$.**
27. In Fig 15.38 line currents are **30°** behind the respective phase currents.
28. The delta connected generator shown in Fig 15.38 has phase voltages of 200 V on no load if connections of one of the phases is reversed, then resultant voltages across the mesh is **400 V.**
29. If one line conductor of a 3-phase line is cut, the load is then supplied by **single phase** voltages.
30. The resistance between any two terminals of a balanced star connected load is 12Ω , the resistance of each phase is **6Ω .**
31. The resistance between any two terminals of a balanced delta connected load is 12Ω , the resistance of each phase is **18Ω .**

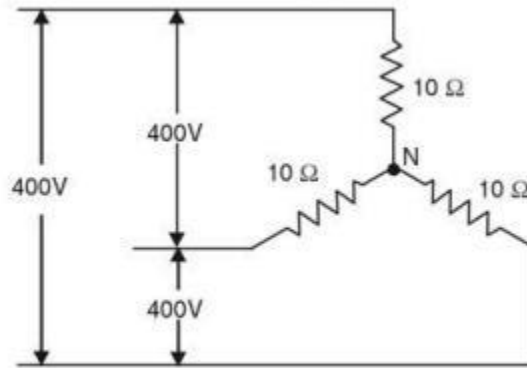


Fig 15.39

32. The voltage rating in each resistor in fig 15.39 is **230 V.**
33. The power rating in each resistor in fig 15.39 is **5290 W.**
34. If one of the resistors in fig 15.39 were open circuited then power consumed in the circuits is **8000 W.**
35. The power consumed in the star connected load shown in Fig. 15.40 is 690 W. The line current is **1 A.**

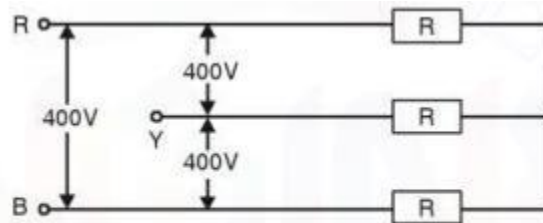


Fig 15.40

36. If one of the resistors in Fig. 15.40 is open circuited, power consumption will be **345 W.**
37. The power factor of the star connected load shown in Fig. 15.41 is **0.6 lagging.**

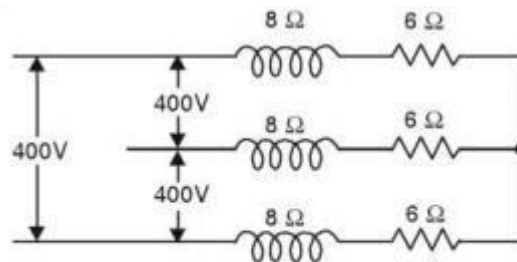
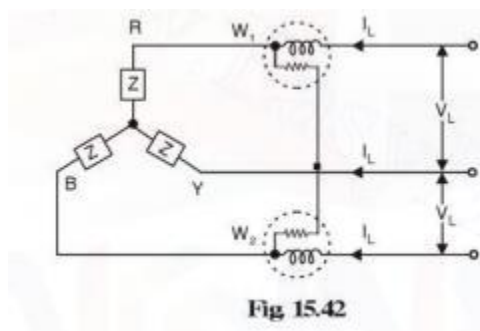


Fig 15.41

38. The voltage drop across each inductor in Fig. 15.41 is **184 V.**
39. The power consumed in each phase of the circuit shown in Fig. 15.41 is **3174 W.**

40. Three identical resistances connected in star consume 4000 W. If the resistances are connected in delta across the same supply the power consumed will be **12000 W.**
41. Three identical resistances, each of 15Ω are connected in delta across 400 V, 3-phase supply. The value of resistance in each leg of the equivalent star connected load would be **5 Ω .**
42. Three identical capacitances, each of $450 \mu F$ are connected in star. The value of capacitance in each phase of equivalent delta-connected load would be **150 μF .**
43. Three identical resistances, connected in star carry a line current of 12 A. If the same resistances are connected in delta across the same supply the line current will be **36 A.**
44. Three delta-connected resistors absorb 60 kW when connected to a 3-phase line, if the resistors are connected in star, the absorbed will be **20 kW.**
45. If a balanced delta load has an impedance of $(6+j9) \Omega$ per phase, then impedance of each phase of equivalent star connected load is **$(2+j3) \Omega$.**
46. In order to measure power in 3-phase, 4-wire unbalanced load, the minimum number of wattmeter required would be **3.**
47. A wattmeter measures **Average Power.**
48. In the circuit shown in fig. 15.42 the phase sequence is RYB. If the load pf is $\cos \phi$ lagging, then reading of wattmeter W2 will be **$V_L I_L \cos(30^\circ - \Phi)$.**



49. If the PF of the load shown in fig. 15.42 (phase sequence is RYB) is zero, then **W1 and W2 will read equal and opposite.**
50. If the pf of the load (phase sequence is RYB) in fig. 15.42 is unity then, **both W1 and W2 will give equal and positive reading.**
51. If the pf of the load (phase sequence is RYB) in Fig. 15.42 is 0.5 then **W2 will give total power.**

52. If the pf of the load (phase sequence is RYB) in Fig. 15.42 is 0.4 then **W1 will give negative reading.**
53. If the capacitors of equal capacitance are shunted across each phase in Fig. 15.42 then **total power draw will not change.**
54. In two wattmeter method, the algebraic sum of the readings of two wattmeter will indicate true power only if **neutral wire available does not carry any current.**
55. Three wattmeter method is not used to measure power in a 3-phase circuit because **generally neutral is not available or delta load cannot be opened.**

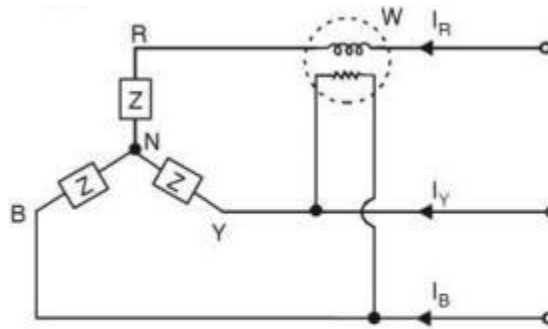
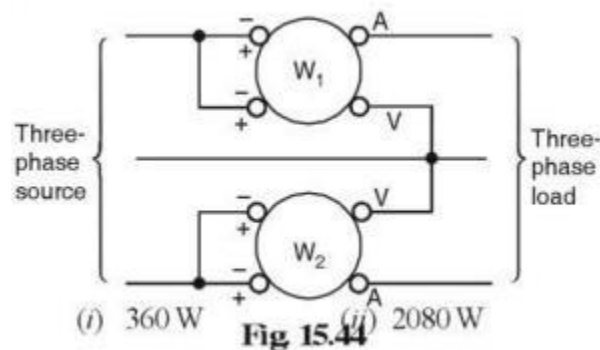


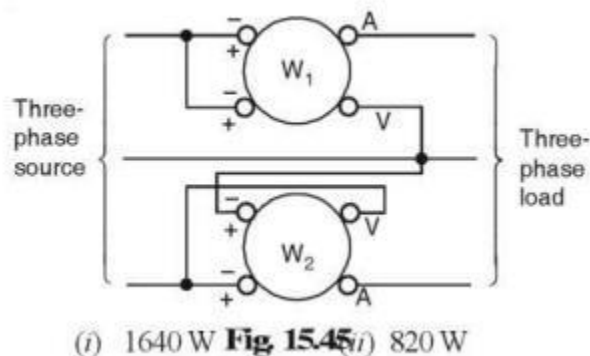
Fig 15.43

56. In the circuit shown in fig. 15.43 the wattmeter reads 1000 W. total reactive power drawn by the balanced 3-phase load is **1732 VAR.**
57. The most difficult unbalanced 3-phase load to deal with is **unbalanced 3-wire Y connected load.**
58. The phase voltage in 3-phase circuit is $90^\circ < -50^\circ$. the power factor is **0.766.**
59. In the above question what is phase reactive power **144.6 VAR.**
60. In Q. 58 the phase apparent power is **225 VA.**
61. The phase power in a circuit is 500 W. The phase current is 5 A and phase voltage is 120 V. the reactive power is **331.7 VAR.**
62. In the above question load pf is **0.832.**
63. In a 3-phase circuit, the load pf is 1, the relation between apparent power (S) and true power (P) is **$P = S.$**

64. At 80° phase R is -138 V, and phase Y is $+154$ V. The voltage of phase B is **-16 V**.
65. In a 3-phase circuit, true power **cannot exceed apparent power**.
66. A lagging pf can be improved by connecting a **capacitor in parallel with load**.
67. When 3-phase system is balanced, the neutral wire carries **one-third of current of each phase**.
68. In a single phase circuit, the total instantaneous power is equal to instantaneous power per phase multiplied by **twice the line frequency**.
69. In a 3-phase circuit the total instantaneous power is equal to instantaneous power per phase multiplied by **1.5**.
70. In the two wattmeter method of 3-phase power measurement, the load is resistive. The readings of the Wattmeters are W_1 and W_2 then **$W_1 = W_2$** .
71. Referring to fig. 15.44 wattmeter W_1 reads 1220 W while wattmeter W_2 reads 860 W. The power of load will be **2080 W**.



72. In the fig. 15.45 W_1 indicates 600 W and W_2 indicates 1040 W. The load power will be **440 W**.



73. The instantaneous power of a balanced three-phase load is 2000 W, when phase R is at its peak voltage. What will the instantaneous power be at 30° later? **2000 W.**
74. An Ac volt meter connected in series with the coils of a correctly phased delta-connected source should indicate **0 V.**
75. In a single circuit a wattmeter indicates 2000 W. the circuit current is 3 A and the circuit voltage is 115 V. The reactive power is **281 VAR.**
76. In the above question load pf will be **0.58.**
77. For most efficient use of power distribution equipment, the power factor should be **1.**
78. A wattmeter uses **electro-dynamometer movement.**
79. In a balanced 3-phase system, the phase voltage is $200 \angle 30^\circ$ V and phase current is $8 \angle -20^\circ$ A. load pf will be **0.64 lagging.**
80. The phase relationship between line currents in a delta system is **120° between each line current.**
81. In delta-connected load, each impedance is $15 \angle -20^\circ \Omega$. If the phase current is $13.87 \angle 20^\circ$ A, load pf will be **0.94.**
82. A low lagging pf results in **poor voltage regulation.**
83. A 30 MVA, 11 KV, 3-phase alternator supplies full load at lagging power factor of 0.6. The percentage increase in earning capacity when the pf is raised to 0.9 **becomes 50 %.**
84. All Ac equipment is rated in KVA **because of temperature rise limitation.**
85. When the pf is improved, lagging reactive power supplied to the load **decreases.**
86. The wattmeter in Fig. 15.46 indicates 1420 W. The power of three phase load is **4260 W.**

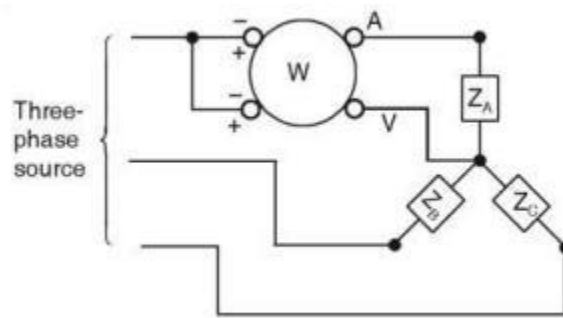


Fig. 15.46

87. If wattmeter is normally phased and it indicates reverse reading, the current and voltage are **less than 90° out of phase.**

88. A capacitor C is connected in parallel with a single phase induction motor (see in fig. 15.47). the purpose of capacitor is to **decrease lagging reactive power.**

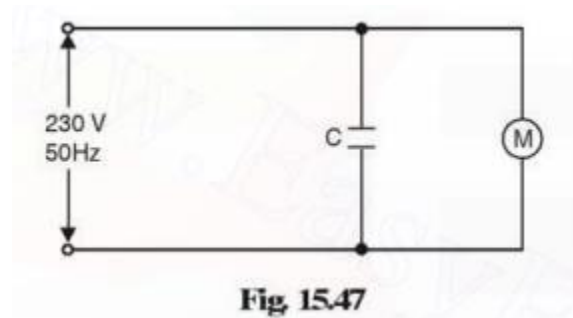


Fig 15.47

89. If in the fig. 15.47 the capacitor is removed the lagging reactive power will **increase.**
90. If in the fig. 15.47, another capacitor of equal capacitance is connected in parallel, then circuit pf will **increase.**
91. When capacitor C is removed in the fig. 15.47, the motor draws a current of 10 A, when capacitance is connected as shown, the motor will draw **10 A.**
92. A 480 V, 60 Hz single phase motor draws a current of 10 A, and operates at a pf of 0.85. If the capacitor of capacitance $29.1 \mu\text{F}$ is connected in parallel with it, circuit pf becomes **1.**
93. In the above question, if the capacitor is replaced by inductor, the circuit pf will be **less than 0.85.**
94. In a 3-phase circuit, if pf is decreased, the line current **increases.**
95. When a capacitor connected across a single phase motor, the active power drawn by the motor **remains same.**
96. A balanced Δ connected load is converted to equivalent balanced Y load. Then **$Z_Y = 1/3 Z_\Delta.$**
97. The line current in a balanced delta system is 30 A. Magnitude of load current will be **17.32 A.**
98. Two wattmeter method is used to measure the power in 3-phase system. When both meters are normally phased, the meter readings are 2400 W and 1260 W. What is the load power. **3660 W.**
99. If in the above question , the wattmeter which indicates 2400 W had required reverse phasing to obtain forward reading, load power will be **1140 W.**

100. The line current in a 3-phase, 4-wire system are $9 \angle -60^\circ$ A, $15 \angle 40^\circ$ A and $12 \angle 130^\circ$ A,
The neutral wire current is **$13.8 \angle 53.1^\circ$ A.**

Chapter # 16

1. An ammeter is **an indicating** instrument.
2. The controlling torque of an indicating instrument **increases** as the deflection of the moving system increases.
3. When the pointer of an indicating instrument comes to rest in the final deflected position both **deflecting & controlling torques act**.
4. When the pointer of an indicating instrument is in motion, then deflecting torque is opposed by **both damping & controlling torques**.
5. The pointer of an indicating instrument is generally made of **aluminum**
6. When the pointer of an indicating instrument is in the final deflected position **damping torque is zero**
7. In eddy current damping, disc or former is made of a material that is a **conductor but non-magnetic**
8. In general, fluid friction damping is not employed in indicating instruments although one can find its use **Kelvin electrostatic voltmeter**
9. Permanent-magnet coil instrument can be used for **dc work only**
10. The scale of a permanent-magnet moving coil instrument is uniform because **it is spring controlled**
11. Shunts are generally made of **manganin**
12. The range of a permanent-magnet moving coil Instrument is 0-10 A, If the full- scale deflection current of the meter is 2 mA then multiplying power of the shunt is **5000**
13. A moving coil instrument having meter resistance of 5-ohm is to be used as a voltmeter of range 0-100 V. If the full-scale detection current is 10 mA, then required series resistance **9995 ohm**
14. The multiplying power of shunt of a milliammeter is 8. If the circuit current is 200 mA, then current through meter is **25 mA**
15. The material of the shunt should have **negligible** temperature coefficient of resistance.
16. A small swamping resistance is put in series with operating coil of a moving coil ammeter in order to compensate for the effects of **temperature variation**
17. A moving coil voltmeter gives full-scale deflection of 100 V for a meter current of 1 mA for 45 V reading, the meter current will be **0.45 mA**
18. Dynamometer type instruments can be used of **for both dc and Ac work**
19. A dynamometer Instrument is chiefly used as a **wattmeter**
20. In a dynamometer type instrument, damping is provided by **air friction**

21. Dynamometer type **Wattmeter** has uniform scale.
22. instrument in which springs provide the controlling torque as well as serve to lead current into and out of the operating coil is **permanent-magnet moving coil** instrument
23. If current through the operating coil of a moving-iron instrument is doubled, the Operating force becomes **four times**
24. The full-scale deflection current of a moving coil instrument is about **50 mA**
25. For measuring high values of alternating current with a dynamometer ammeter, we use a **Current transformer**
26. Hot-wire instruments have **Squared** scale.
27. The full-scale voltage across a moving coil voltmeter is about **50 mV**
28. Moving-iron instruments have **Squared** Scale
29. The range of a moving-Iron A.C ammeter is extended by **changing number of turs of operating coil**
30. To measure high-frequency currents, we mostly use **thermocouple** ammeter
31. For the measurement of high direct voltage (say 10 k V), one would use **electrostatic** voltmeter.
32. **Dynamometer** movement is most expensive.
33. Electrostatic instruments are used as **voltmeter only**
34. An electric pyrometer is an instrument used to measure **high temperature**
35. The best type of meter movement is **D'Arsonval**
36. **permanent-magnet moving coil** instrument are most sensitive
37. In induction type ammeter **eddy current** damping is provided
38. The most commonly used induction type instrument is **induction watt-hour meter**
39. All voltmeters except **electrostatic** voltmeters are operated by the passage of current
40. The watt-hour meter is **an integrating** instrument
41. Indicating instruments are assumed to be most accurate **at half of full** part of scale.
42. **1 uA** meter will be the most sensitive.
43. On simple ohmmeter, the 0-ohm mark **far right** is of the scale,
44. If a wattmeter connected in circuit gives down scale reading, then we normally Change connections of **potential coil**
45. A permanent magnet moving coil ammeter is connected in 50 Hz AC circuit in which 5A current is flowing. The meter will read **0 A**

46. In the above question (45), if the meter remains connected in the circuit for some time **meter coil is burnt**
47. If in question 45, the frequency of AC is 0.1 Hz, the pointer will **rise from zero and then falls back**
48. On a simple ohmmeter, the infinity “ohm” **far left** mark is of the scale
49. The instrument used in an ohmmeter is generally **permanent magnetic moving coil type**
50. When the terminals of a series ohmmeter are open-circuited, the pointer reads **infinity**
51. Out of the following, the most accurate measurement of unknown resistance will be by **Wheatstone bridge**
52. 50 V range voltmeter has a sensitivity of 20 k ohm/ V The total resistance of the voltmeter is **1 M-ohm**

53. Fig, 16.44 shows voltmeter-ammeter method of measuring the value of resistance R. This method is used to measure R if its value is **very high and moderate**

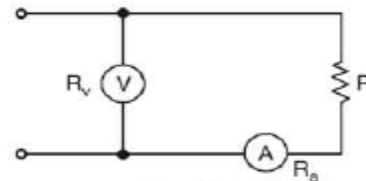


Fig 16.44

54. Fig, 16.45 shows voltmeter-ammeter method of measuring the value of resistance R. This method is used to measure R if its value is **Very Low**

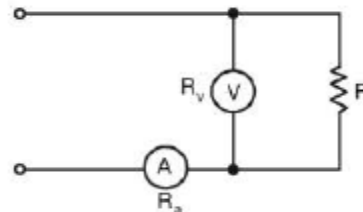


Fig 16.45

55. The series ohmmeter shown in Fig, 16.46 is made up of a 3 V battery, a 100 uA meter and a resistance r which has a fixed value of 30 k-ohm. What the value of unknown resistance R, when the pointer indicates half full-scale deflection? **30 K-ohm**

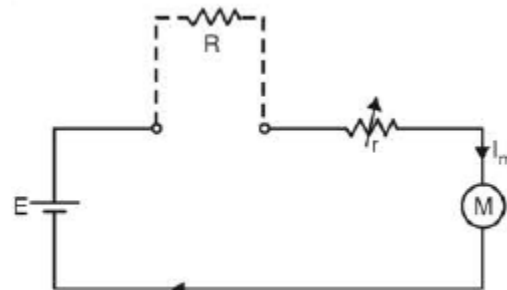


Fig 16.46

56. In above question (55), what is the value of R if pointer indicates 3/4th full scale deflection? **10 K-ohm**
57. In the Figure 16.46, the resistor r is for **Zero adjustment**
58. The Scale of an ohmmeter is **non-linear**

59. Fig. 16.47 shows a permanent magnet moving coil (PMMC) voltmeter having range of 100V. The coil resistance is 100 Ohm and full -scale deflection current is 50 uA. What IS the value of voltmeter sensitivity? **20 K-ohm/V.**

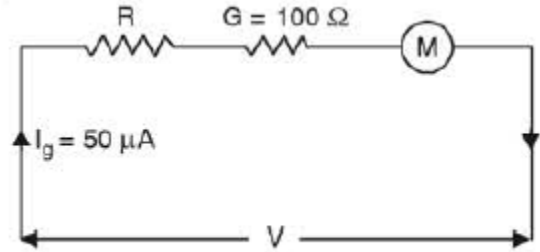


Fig 16.47

60. In the above question, what is the voltmeter sensitivity if the range is 50 V? **20 K-ohm/V.**

61. In the circuit shown in Fig. 16.48, what is the voltage across R2 without the voltmeter in the circuit? **0.99 V**

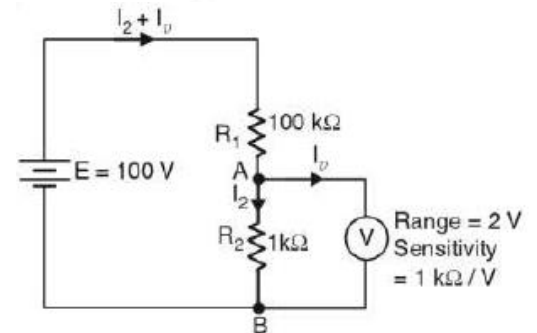


Fig 16.48

62. In the above question (61), what is the voltage across R2 with voltmeter connected in the circuit. **0.66 V**

63. In the circuit shown in figure. 16.49, what is the value of unknown resistor R? The Voltmeter reads 4V. **290 K-Ohm**

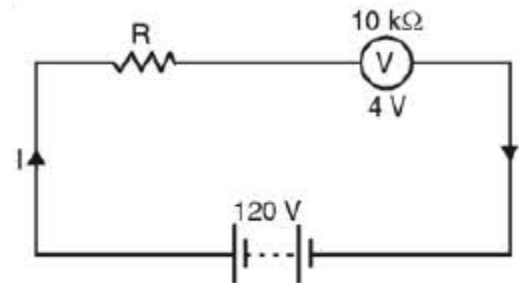


Fig 16.49

64. In the above question (63), a voltmeter is used instead of ammeter. It is because. **The value of R is very large**

65. Resistance of an ammeter having range 0- 5 A is 1.8 Ohm. It is shunted by a resistor of 0.2 Ohm. What is the effective current when the pointer reads 2 A? **20 A**

66. In the dynamometer wattmeter, the moving coil is the **Potential Coil**

67. Fig. 16.50 shows an ammeter, a voltmeter and a wattmeter connected in the circuit. The wattmeter will read **Upscale**

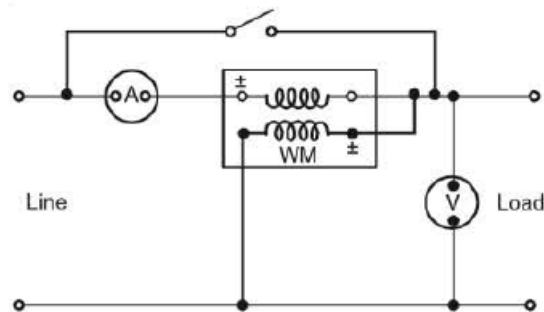


Fig 16.50

68. In the circuit shown in Fig. 16.50, wattmeter reading will be **more than actual load power**

69. In Fig. 16.50, the ammeter reading will be **more than the load current**

70. A dynamometer wattmeter with its voltage coil connected across the load side reads 192 W (Sec Fig, 16.51). The load voltage is 208 V and the resistance of potential coil is 3825 Ohm. What is the true load power? **180.7 W**

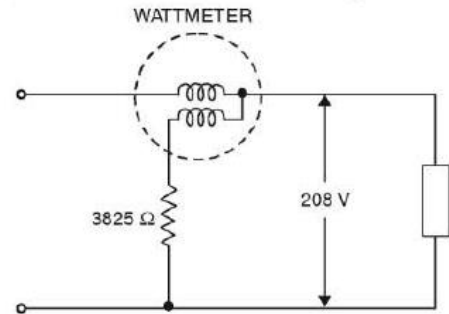


Fig 16.51

71. In the above question (70), what is the percentage error due to wattmeter connection? **6.25%**

72. In Figure 16.52, the resistance of two coils of wattmeter are 0.01 Ohm and 1000 Ohm respectively and both are non-inductive, the load is taking a current of 20 A at 200 V and 0.8 p.f. lagging of wattmeter? **3204**

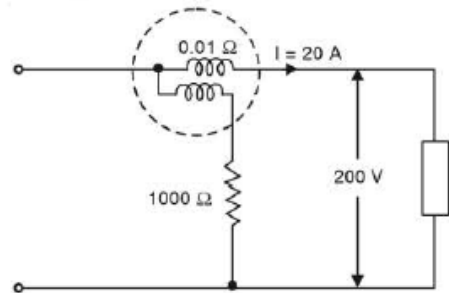


Fig 16.52

73. In the above question (72), what is the percentage error in reading of wattmeter? **0.125%**

74. Fig. 16.53 shows another way of connecting the wattmeter in the circuit. If the load pf is 0.8 lagging, what is the reading of the wattmeter? **1976 W**

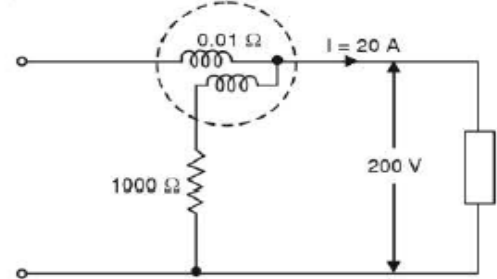


Fig 16.53

75. In the above question (74), what is the percentage error in reading of wattmeter? **1.25%**

76. Induction wattmeter can measure **AC Power Supply**

77. To measure AC as well as DC power, we use **dynamometer wattmeter**

78. In a single-phase energy meter, braking torque is provided by **Permanent magnet**

79. The meter constant of an energy meter is 1500 rev/kWh, the disc makes 3000 revolutions in a given time, the energy consumed is **2 kWh**

80. A 230 V, 50 Hz single-phase energy meter has a load current of 10 A a p.f. of lagging. The energy consumed by the load in 2 minutes is **0.06 kWh**

81. In the above question (80), if the disc makes 72 revolutions per minute, what is the meter constant? **1200 rev/kWh**
82. In a single-phase energy meter, if the brake magnet is moved towards the center of the spindle, the disc **speed increases**
83. An energy meter whose meter constant is 1500 rev/kWh makes 20 revolutions in 30 seconds. The load in kW is **1.6 kW**
84. A 230 V single phase energy meter has a constant load current of 4 A passing through it for 5 hours at unity power factor. If the meter makes 1104 revolutions during this period, the meter constant is **240 rev/kWh**
85. In the above question (84), if the load p.f. is 0.8, the number of revolutions the disc will make in above time (5 hours) is about **883**
86. The full-scale deflection current of a permanent magnet moving-coil (PMMC) meter is 1 mA and the coil resistance is 50 Ohm, the least voltage that can be measured with this meter is **50 mV**
87. If the full-scale current of a meter is 50 μ A, then its sensitivity is **20,000 Ohm/V**
88. A 100 V, full-scale, 100 Ohm/volt meter has a full-scale deflection current of **1 mA**
89. With a potentiometer, null points are obtained at 140 cm and 180 cm with cells of e.m.f. 1.1 V and one of the unknown e.m.f. respectively. The unknown e.m.f. is **1.41 V**
90. In a potentiometer experiment, it is found that no current flows through the galvanometer when the terminals of the cell are connected across 52 cm of potentiometer wire. If the cell is shunted by a resistance of 5 Ohm, the balance point is found at 40 cm of the wire from the same end. The internal resistance of the cell is **1.5 Ohm**
91. A potentiometer wire is 10m long. It has a resistance of 20 Ohm. It is connected in series with a battery of e.m.f. 3 V and negligible resistance and a resistance of 10 Ohm. The potential gradient along the wire in volt/meter is **0.2**
92. In a potentiometer experiment, it is found that no current flows through the galvanometer when the terminals of the cell are connected across 125 cm potentiometer wire. On shunting the cell by 2 Ohm resistor, the balancing length is reduced to half. The internal resistance of the cell is **2 Ohm**
93. A moving coil galvanometer has a sensitivity of 60 divisions/amp. When a shunt is used, its sensitivity becomes 10 divi/amp. What is the value of the shunt used if the resistance of the galvanometer is 20 Ohm? **4 Ohm**
94. Which of the following is likely to have the largest resistance? **voltmeter of range 10 V**

95. If 2 % of the main current is to be passed through a moving coil galvanometer of resistance G , the resistance of the shunt required is **$G/49$**
96. A galvanometer has a resistance of G ohms, it is shunted by a resistance of S ohms, how much resistance should be added so that the main current remains unchanged? **$(G^2)/(G+S)$**
97. In a moving coil galvanometer, the deflection becomes one-half when the galvanometer is shunted by a 20 Ohm resistor. The galvanometer resistance is **20 Ohm**
98. It is required to convert a moving coil galvanometer of current range 15 mA and voltage range 750 mV into an ammeter of range 2.5 A. What is the value of shunt resistance required? **0.3 Ohm**
99. A moving coil galvanometer of resistance 25 Ohm is connected to a source of e.m.f. 2 V with a resistance of 3 k Ohm. Full-scale deflection of 30 units is obtained. When 3k Ohm resistance replaced by R , the deflection becomes 20 units. The value is approximately **4.5 K Ohm**
100. A moving coil galvanometer with a scale divided into equal divisions has a current sensitivity of 10 divisions per mA and voltage sensitivity of 50 divisions per m V. To convert It into an ammeter of range 5 A, the necessary shunt resistance required is **5/499 Ohm**
101. Deflection of a moving coil galvanometer falls from 50 divisions to 20 divisions when a 12 Ohm shunt is applied. Galvanometer resistance is **18 Ohm**
102. A voltmeter of resistance 998 Ohm is connected in series with a cell of e.m.f. 2 V and internal resistance 2 Ohm. The percentage error the reading of voltmeter is **0.2 %**
103. In an ammeter. 5 % of main current passes through the galvanometer. If resistances of the galvanometer and shunt are G and S respectively, then, **$S= S/19$**
104. To send 10 % of main current through a moving coil galvanometer of rest stance 99 Ohm the value of shunt resistance required is **11 Ohm**
105. The sensitivity of a moving coil galvanometer is 60 divisions/ampere. When a shunt is used, the sensitivity becomes 10 divisions/ampere. If the galvanometer resistance is 20 Ohm, the value of shunt is **4 Ohm**

106. A 20 μA , 200 mV meter movement is used a 25 V voltmeter What is the sensitivity? **50 K-Ohm/V**
107. In the above question (106), what is the value of multiplier resistance?
1240 K Ohm
108. In the above question (106), what is the total resistance of voltmeter?
1250 K Ohm
109. A series ohmmeter circuit uses a 3 V battery and 1 mA meter movement. What is the half scale resistance for this ohmmeter? **3 K Ohm**
110. A 10 V range voltmeter is rated for 50 μA full-scale current. The total resistance of voltmeter is **200 K Ohm**

V.k. Mehta Chapter 18 (D.C MOTOR)

1. A D.C Motor is used to **Change Electricity Energy to Mechanical Energy.**
2. A D.C Motor Is Still used In Industrial application because It **Provide Fine Speed to Control.**
3. Carbon Brushes are Preferable to Copper Brushes Because **They Reduce Sparking.**
4. The Field Poles And Armature Of A D.C Machine Are Laminated to **Reduce Eddy Currents.**
5. The Back E.M.F In A D.C Motor **Opposes The Applied Voltage.**
6. The Value of Back E.M.F (E_b) In D.C Motor Is Maximum **At No Load.**
7. The Motor Equation Is Given By **$V = E_b - I_a r$.**
8. The Mechanical Power Developed an A D.C Motor Is Maximum When Back E.M.F (E_b) Is Equal to **half of** The Applied Voltage (V).
9. When the Speed of a D.C Motor Increases Its Armature Current **decreases.**
10. The Amount of Back E.M.F Of a Shunt Motor will Increase when **the Field Is Strengthened.**
11. The Speed Of A D.C Motor Is **Inversely Proportional To Flux Per Pole.**
12. The Torque Developed By a D.C Motor Is Directly Proportional to **Flux Per Pole X Armature Current.**
13. The Shaft Torque (T_h) In A D.C Motor Is Less Than Total Armature Torque (T_n) Because Of **Iron And Friction Losses** In A Motor.
14. Armature Reaction In A D.C Motor Is Increased **When The Armature Current Increases.**
15. With Respect To the Direction of Rotation. Interlopes On A D.C Motor Must Have The Same Polarity As The Main Poles **Behind Them.**
16. In A D.C Motor The Brushes Are Shifted From The Mechanical Neutral Plane In A Direction Opposite To The Rotation to **Reduce Sparking.**
17. In Very Large D.C Motors With Severe Heavy Duty Armature Reaction Effects Are Corrected By **Using Compensatory Windings In Addition To Interpol's.**
18. The Speed of A **shunt** Motor Is Practically Constant.
19. **Series** Motor Is Variable Speed Motor.
20. the Most Commonly Used Method of Speed Control of a D.C Motor Is By Varying Field **Strength**
21. The Running Speed Of A D.C Series Motor Is Basically Determined By **Load.**

22. After A Shunt Motor Is Up To Speed. The Speed May Be Increased Considerably By **Decreasing Field Circuit Resistance**.
23. **Shunt** Motor Has The Best Speed Regulation.
24. The Deciding Factor in The Selection of A D.C Motor For A Particular Application Is Its **Speed torque** Characteristic.
25. The Demand for a Large Increase in Torque and A D.C Shunt Motor is met by large **increase in current**.
26. The Demand for A Large Increase in Torque of a D.C Series Motor is met is a **Large Decrease in Speed**.
27. A Series Motor Will Over Speed When **Load Is Removed**.
28. As The Load Increases, **Differentially Compounded** a Motor Will Speed Up.
29. A Cumulatively Compounded Motor Does Not Run At Dangerous Speed at Light Loads Because Of the Presence of **Shunt Winding**
30. D.C Shunt Motor Are Used In Those Application **Practically Constant Speed** where Is Required.
31. D.C Series Motors Are Used in Those Application Where **high starting torque** Is Required.
32. Cumulatively Compounded Motors Are Used Where We Require **Sudden Heavy Loads For Short Duration**.
33. For The Same Rating **Series** Motor Has The Highest Starting Torque.
34. **Series** Motors Never Use Belt-Connected Loads.
35. For 20% Increase in Current, the Motor That Will Give the Greatest Increase In Torque Is **Shunt**.
36. The **series** Motor Is Used TO Start Heavy Loads.
37. When Load Is Removed, The Motor That Will Run at the Highest Speed Is the **series** Motor.
38. For The Same Rating **Shunt** Motor Has The Least Starting Torque.
39. A D.C Series Motor Is Most Suitable For **Cranes**.
40. **Cumulatively Compound** Motor Is Most Suitable For Punch Presses.
41. In a Vacuum Cleaner, We generally Use **Series Motor**.
42. The Most Suitable Motor For Elevators Is The **Cumulatively Compound** Motor.
43. The Friction and Windage Losses in D.C. Motor Depends Upon **Speed**.

44. The Iron Losses In A D.C. Motor Depend Upon **Both Flux And Speed.**
45. The Greatest Percentage Of Power Loss In A D.C Motor Is Due To **Copper Loss.**
46. A Motor Takes A Large Current At Starting Because **Back E.M.F Is Low.**
47. Excessive Sparking At The Brushes May Be Cause Due To **Dirt On The Commulator.**
48. Excessive Motor Vibration is caused by **too much brush tension.**
49. Overheating Of A D.C Motor Is Often Due to **In Sufficient End Play.**
50. Hot Bearing Of A D.C Motor May Be Caused by **Lack Of Or Dirty Lubricant.**
51. Intermittent Sparking At The Brushes Of A D.C Motor May Be Caused Due To **an Open Armature Coil.**
52. A 440 V Shunt Motor Has An Armature Resistance Of 0.8Ω And A Field Resistance Of 200Ω . **425.8v** is the Back E.M.F when Giving an Output Of 7.46KW at 85%Efficiency.
53. A 250V D.C Shunt Motor Takes A Total Current Of 20Ω . A Resistance Of Shunt Field Winding Is 200Ω And That Of Armature Is 0.3Ω . **9.65A** is the Current in the Armature.
54. In The Above Question, **244V** Is The Approximate Value Of Back E.M.F.
55. A 220 V D.C Shunt Motor Takes A Total Resistance Of Shunt Field Is 50Ω And That Of Armature 0.1Ω The Iron And Friction Losses Amount To 1600 W. **16050 W** Is The Driving Power Of The Motor?
56. IN Question 55, **19.37** Is B.H.P.
57. IN Question 55, **1550 W** the Copper Losses.
58. In Question 55, **212Nm** Is the Armature Torque.
59. IN Question 55, **11Nm** Is the Lost Of The Torque.
60. IN Question 55, **173Nm** is the Shaft Torque.
61. A D.C Shunt Motor Takes 5A At 100 V When Running Light. Shunt Field Resistance Is 50Ω And Armature Resistance Is 0.2Ω . **298W** Is Driving Power.
62. In the Above Question, Iron and Friction Losses are **298 W.**
63. A 220 V D.C Series Motor Is Taking a Current Of 40 A. Resistance Of Armature. 0.5Ω And Resistance Of Series Field 0.25Ω . **190V** Is The Voltage At The Brushes.
64. IN Question 56, **190V** Is The Back E.M.F.

65. A D.C Shunt Motor is taking 84A At 100 V and developing 0.05Ω And Shunt Field Resistance 25Ω The Copper Loss Is **720 W**.
66. IN above Question Iron and Frictional Loss Is **1260 W**.
67. IN Question 65. **80%** Is The Overall Efficiency.
68. A 220 V Series Motor Takes A Current of 35A And Runs at 500 R.P.M Armature Resistances = 0.3Ω Iron and Friction Losses Amount to 600 W. **122.5Nm** Is Armature Torque?
69. In above Question .**122.5Nm** is The Shaft Torque.
70. IN Question 68. **83.4%** Is Overall Efficiency.
71. The Armature Of Torque Of A D.C Motor Running Of 800 R.P.M Is 99.3Nm Shaft Torque Is 93.Nm. The Iron and Friction Losses is **502 W**.
72. A 4 pole 250 V Series Motor Has a Wave Connected Armature With 125 4 Conductors the Flux per Pole Is 22m Wb when the motor Is taking 50A. Iron And Friction Losses Amount To 1000W Armature Resistance 0.2Ω Series Field Resistance 0.2Ω. **250 R.P.M** Is The Speed Of The Motor?
73. IN above Question. **14.08** Is B.H.P.
74. IN question 72. **400Nm** Is The Shaft Torque.
75. IN Question 72. **84%** Is the Overall Efficiency.
76. **Series** Motor Should Not Be Used For Centrifugal Pumps.
77. Two Series Motors Are Mechanically Coupled One Machine Is Run As A Motor and the Other as a Generator. The Iron and Friction Losses of the Machine Will Be Identical when **their speed and excitations are identical**.
78. A D.C Shunt Motor Runs At 500 R.P.M At 220 V. A Resistance Of 45 Ω Is Added In Series With The Armature For Speed Control. The Armature Resistance 0.5 Ω .The Current to Stall the Motor Is **44A**
79. If The Applied Voltage To A D.C Machine Is 230 V Then Back E.M.F For Maximum Power Developed **115V**.
80. The Armature Resistance of 6pole Lape Wounded Generator Is 0.05Ω. If The Armature Is Redounded Using The Wave Winding The Armature Resistance Will Be **0.45Ω**.
81. A 220 V Machine Has Armature Is 1Ω; the Full Load Current Is 20 A. Then The Difference In The Induce Voltage When The Machine Is Running As A Motor And As A Generator Is **40V**.
82. A D.C Motor Runs At 1725. R.P. M at Full Load and 1775 R.P.M at no load, the Speed Regulation is **2.9%**.
83. In A Shunt Motor The Connection Of The Armature As Well As Shunt Field Winding Are Reversed. Then **The Direction Of Rotation Remains Un-Changed**.

84. A 4-Pole 500 V Shunt Motor Has 720 Wave –Connected Conductor No Its Armature .The Full Load Armature Current Is 60 A And Flux Per Pole Is 0.03Wb .The Armature Resistance Is 0.2Ω And Contact Drop Per Brush Is 1V .**486V** Is The Back E.M.F.
85. In The Above Question 84, **675 R.P.M** Is The Full-Load Speed Of The Motor.
86. The Armature Of A 4 –Pole Shunt Motor Has A Lap Winding Accommodard In 60 Slots. Each Contains 20 Conductors. IF The Useful Flux Per Pole Is 23 Wb, The Armature Torque Developed When The Armature Current Is 50A Is **218 Nm**.
87. The Armature of A 6-Pole, 6 Circuit Shunt Motor Takes 400A at a Speed Of 350 R.P.M .The Flux Per Pole Is 80m Wb, The Number Of Armature Turns Is 600 And 3% Of The Torque Is Lost In Windage, Friction And Iron Losses. The Brake Horsepower Is **291H.P**.
88. **1.82N** is The Mean Force on Each Conductor of a 440 V /14 – Pole Shunt Motor with Lap Connected Armature Winding When Running at 100 R.P.M and Taking a Current of 1550 A. Each Conductor as Active Length of 33 C.M and the Armature Diameter Is 130cm. The Total Gape Flux per Pole Is 70m W.B and the Mean Flux Density in the Slots Is 0.05 Wb/m^2 .
89. IN above Question. **2.52N** is The Mean Force of Each Conductor If the Armature Were of Smooth- Core Unsloted Type.
90. A 100h.P, 500 V Shunt Motor Has 4poles And 2 Circuit Wave Connected Armature Winding With 492 Conductors. The Flux Per Pole Is 50m W.B. And The Full Loaded Efficiency Is 92% The Armature And Commutating Field Windings Have A Total Resistance Of 0.1Ω . **590 R.P.M** Is the Full Load Speed .The Shunt Field Resistance Is 250Ω .
91. The Resistance Of Shunt Field Winding As Compared To Series Field Winding Is **More**.
92. The Field Winding Of A Machine Design For Separate Excitation Is **Of The Shunt-Field Type**.
93. The Commutating Winding Is Basically Used In A D.C Machine **To Improve Commutation**.
94. The Commutating Pole Winding Is Connected In **Series With The Armature**.
95. Commutating Poles Are Also Known As **Interpol's**.
96. A Shunt Motors Runs at 500 R.P.M on a 200 V Circuit. Its Armature Resistance Is 0.5Ω . And The Current Taken Is 30 A In Addition To Field Current. **2.47Ω** Resistance Must Be Place In Series With Armature Circuit To Reduce To Speed To 300 Rpm the Current in Armature Remaining the Same.
97. A 200 V D.C Series Motor Runs at 500 R.P.M, when taking a Line Current Of 25A.The Resistance of The Armature Is 0.3Ω and that of the Series Field 0.5Ω . If the Current taken Remains Constant. **2.16Ω** is the Resistance Necessary to Reduce the Speed to 350 R.P.M.
98. IN A D.C Compound Machine Shunt **Field Winding Plays Dominant Role**.

99. The Compensating Winding Is Connected **In Series With Armature.**
100. A Compensating Winding Is an Auxiliary Winding Embedded in Slots **in the Pole Faces of Main Poles.**
101. A 10 Pole D.C Machine Has A Lap Wounded Armature. It Has 600 Conductors Each Resistance 0.05Ω **0.3Ω** Is the Armature Resistance
102. If The Above Machine Had Wave Wound Armature The Armature Resistance Would Be **1Ω .**
103. A D.C Shunt Motor Is Rotating At 267 Rad/Sec And Developing 57.2 N/M Of Torque. **15.3Kw** Many Kilo Watts Of Mechanical Power Are Developed.
104. A 20 H.P. D.C Motor Has 89.3% Efficiency At Rated Power. **1787W** Are Total Loses.
105. A 200 V Shunt Motor Develops 23 H.P When Taking 20.2 Kw The Field Resistance Is 50Ω And Armature Resistance Is 0.06Ω . **3042W** Are The Total Losses.
106. In the Above Question **1365W** Are The Total Copper Losses.
107. in the Question 107. **1677W** Are Rotational Losses.
108. in the Question 107. If The Output Of The Motor Is 10 H.P **2584W** Are The Total Losses.
109. A 240 V Series Motor Takes 40 A When Giving Its Rate output At 1500 R.P.M. Its Resistance Is 0.3Ω
 5.7Ω Resistance Must Be Added To Obtain Rate Torque at Starting.
110. The Above Question, **1.9Ω** Resistance Must Be Added To Obtain Rated Torque at 1000r.P.M.
111. A Series Motor of Resistance 1Ω between the Terminals Runs At 800 R.P.M at 200 V with a Current of 15A. **476R.P.M** , the Speed at Which It Will Run When Connected In Series with a 5Ω Resistance and Taking the Same Current at the Same Supply Voltage.
112. **1058r.p.m** is the Speed When The Flux Is Reduce By 10% In 200 V D. C Shunt Motor Having An Armature Resistance Of 0.2Ω Caring Current Of 50 A And Running At 960 R.P.M. Prior To Weakening Of Field The Total Torque May Be Assumed To Be Constant And Iron And Friction Losses May Be Neglected .
113. By Flux Control Method of Speed Control of A D. C Shunt Motor we Can Obtain Speeds **above the Normal Speed Only.**
114. By Putting Controller Resistance Series With The Armature Of A D.C Motor We Can Obtain Speed As **Below The Normal Speed Only.**
115. Motor Starters Are Essential For **Avoiding Excessive Starting Current.**
116. The Only Disadvantage Field Controlled Method For Controlling The Speed Of D.C Shunt Motor Is That It **Adversely Affects Commutation.**

117. The Rheostat Speed Control Method Is Very **Unsuitable For Rapidly Changing Loads.**

V.k. Mehta chapter 19(Transformer)

1. A transformer will work on **A.C only**.
2. The primary and secondary of a transformer are **magnetically** coupled.
3. A transformer is an efficient device because it **is a static device**.
4. A transformer transfers electrical energy from primary to secondary usually with a change **in voltage**.
5. The voltage per turn of the primary of a transformer **is the same as** the voltage per turn of the secondary.
6. The winding of the transformer with greater number of turns will be **high –voltage winding**.
7. A transformer does not possess **power** changing property.
8. The iron core is used to **provide tight magnetic coupling of the transformer**.
9. If a transformer core has air gap, then, **magnetizing current is greatly increased**.
10. The maximum flux produced in the core of a transformer is inversely **proportional to supply frequency**.
11. The flux in the core of a single – phase transformer **is purely alternating one**.
12. A transformer is so designed that primary and secondary have **tight magnetic coupling**.
13. When the primary of a transformer is connected to a D.C supply so that **primary may burn out**.
14. An ideal transformer is one which **has no losses and leakage reactance**.
15. A low voltage outdoor lighting system uses a transformer that steps 120V down to 24V for safety. The equivalent resistance of all low- voltage lamps is 9.6 ohm. **2.5 A** is the current in the secondary coil.
16. In the above question **0.5A** is the current in the primary coil.
17. In Q.15, **60W** power is used.
18. A transformer has efficiency of 80% and works at 100V, 4KW. If the secondary voltage is 240 V. **40A** is the primary current.
19. In the above question **13.33A** is the secondary current.
20. A 2000/200 V, 20KVA ideal transformer has 66 turns in the secondary. The number of primary turns is **660**.
21. In the above question, **100 A** is the full- load secondary current.
22. In Q.20 **10A** is the full- load primary current.
23. The no load ratio of a 50 Hz single phase transformer is 6000/250V. The maximum flux in the core is 0.006Wb. **450** is the number of primary turns.
24. In the above question, **19** is the number of secondary turns.
25. A 20-turn iron core inductor is connected to a 100V, 50Hz source. The maximum flux density in the core is 1wb/m^2 . The cross sectional area of the core is **0.0225m^2** .
26. **1125cm^2** the core area required for a 1600KVA, 6600/440, 50 Hz single phase core- type power transformer. Assume maximum flux density of 1.2 W and induced voltage per turn of 30V.
27. An iron- cored transformer working at a maximum flux density of 0.8wb/m^2 is replaced by silicon steel working at a maximum flux density of 1.2Wb/m^2 . If the total flux is to

- remain unchanged, 33% is the reduction in volume expressed as a percentage of the original volume? The frequency and voltage per turn are the same
28. A single phase transformer has 400 primary and 1000 secondary turns. The net cross sectional area of the core is 60cm^2 . If the primary is connected to 500V, 50 Hz source, the peak value of flux density in the core is 0.94Wb/m^2 .
 29. In the above question 0.25 Wb/m^2 is the voltage induced in the secondary.
 30. A single phase 50Hz core – type transformer has square core of 20cm side. The permissible flux density is 1 Wb/cm^2 . If the stacking factor is 0.9, the voltage induced per turn is 8.
 31. The no load primary current I_0 is about 3-5% of full load primary current.
 32. The no load p.f of a transformer is small because magnetizing component of I_0 is large.
 33. The no load input power to a transformer is practically equal to iron loss in the transformer.
 34. A transformer takes a current of 0.6A and absorbs 64W when the primary is connected to its normal supply of 200V, 50Hz, the secondary being on open circuit. The iron loss is current is 0.32A.
 35. In the above question, 0.507A is the magnetizing current.
 36. A 230/2300V transform takes no load current of 5A at 0.25 power factor lagging. The core loss is 287.5W.
 37. A 230/2300V transformer takes no load current of 6.5A and absorbs 187W.if the resistance of the primary is 0.06 ohm, 184.5W.
 38. In the above question 0.125 lag is no load power factor.
 39. In Q. 37, 0.81A is the active component of current.
 40. In Q 37, 6.4A is the magnetizing current.
 41. Two things which are same for primary and secondary are ampere-turn and voltage per turn.
 42. A transformer operates poorly at very low frequencies because magnetizing current is abnormally high.
 43. If a power transformer is operated at very high frequencies, then core losses will be excessive.
 44. The primary leakage flux link primary winding only.
 45. The effect of leakage flux in a transformer is to cause voltage drop in the windings.
 46. Leakage flux in a transformer occurs because air is not good magnetic insulator.
 47. The mutual flux in a transformer remains constant at all loads because applied voltage and frequency are constant.
 48. Cores of large transformers are built up to nearly circular cross section in order to reduce copper loss.
 49. The primary and secondary winding are wound on the top of each other in order to reduce leakage reactance
 50. The amount of copper in the primary is about the same as that of secondary.
 51. The open circuit test on a transformer is always made on low voltage winding.
 52. We can find turn ratio of the transformer with open circuit test.
 53. In the short circuit test on transformer we generally short circuit low voltage winding.

54. The open circuit test on a transformer gives **iron losses**.
55. When the secondary of a transformer is short circuited the primary inductance **is decreased**.
56. When load on a transformer is increased the eddy current remains **unchanged**.
57. When load on a transformer is decreased **copper** loss is decreased.
58. The eddy current loss in transformer is directly proportional to **square of thickness of core lamination**.
59. A transformer has full load copper loss of 400w .The copper loss at half full load will be **100w**.
60. A transformer has 200 W as iron loss at full-load. The iron loss at half full – load.
The iron loss at half full-load will be **200w**.
61. A transformer will have zero efficiency at **no loaded**.
62. The efficiency of a transformer will be maximum when **copper loss is equal to constant loss**.
63. The approximate efficiency of a large transformer is **95%**.
64. In a practical transformer, copper losses account for about **85%** of the total losses.
65. By laminating the core of a transformer, we decrease **eddy current loss**.
66. The all-day efficiency of a distribution transformer is **less than** the commercial efficiency .
67. The core-type transformer provides **shorter magnetic path**.
68. The transformer that should never have the secondary open- circuited when primary is energized is **current transformer**.
69. The temperature rise of a transformer is directly proportional to **apparent power**.
70. In an auto transformer, the primary and secondary are **magnetically as well as electrically**.
71. The secondary load impedance of a step- up transformer is Z_s and the primary impedance Z_p will be **less than Z_s** .
72. A 10ohm resistive load is to be impedance matched by a transformer to a source with 650ohm of internal resistance. The ratio of primary to secondary turns of transformer should be **25**.
73. In the above question, if the open- circuited voltage of the source is 50V, **0.1W** will be the secondary power.
74. A $100\angle 0^\circ$ V source of internal impedance $1200\angle 30^\circ$ ohm is connected to a load through a transformer of turn ratio 2:1. For maximum power transfer, the load impedance should **be $300\angle -30^\circ$ ohm**.
75. 108. The secondary load impedance of a step- down transformer is Z_s . The primary impedance Z_p will be **greater than Z_s** .
76. A 10V source of internal resistance 5ohm is connected to a load of 5ohm through a transformer. For maximum power transistor, the turn ration of the transformer should be **1:1**.
77. A single phase transformer with ratio of 6600/600V has a load impedance of $(4+j3)$ ohm connected across the terminal of low voltage winding. The power delivered to the load is **57.6×10^3 W**.

78. Neglecting losses in the transformer in the above question, **10.91A** is the full load primary current.
79. A 10kVA, 2000/400V single- phase transformer has a primary resistance and inductive of 5ohm and 12 ohm respectively. The secondary values are 0.2ohm and 0.48ohm respectively. The equivalent impedance of the transformer referred to primary side is **26ohm**.
80. 113. In the above question, **1.04ohm** is the impedance of the transformer referred to the secondary side
81. A 100KVA, 2200/440V transformer has primary values $R_1=0.3\text{ohm}$, $X_1=1.1\text{ ohm}$ and secondary values $R_2=0.01\text{ohm}$ and $X_2=0.035$. The equivalent impedance of the transformer referred to the primary side is **2.05ohm**.
82. Assuming 100% efficiency of the transformer in the above question, **227.25A** is the full load secondary current.
83. In Q.82, **1136W** are the total copper loss.
84. The steel used for the transformer core has **all of the above**.
85. In a transformer, leakage flux **is minimised by interleaving the primary and secondary windings**.
86. Short – circuit test of a transformer helps us to find **its Full- load Cu loss**.
87. A two winding transformer operates at maximum efficiency when its **Cu loss equals iron loss**.
88. The all- day efficiency of a transformer is **energy efficiency**.
89. The short-circuit test helps us to find **Cu loss at any desired load**.
90. The power efficiency of a lightening transformer is always **higher than** its all-day efficiency.
91. With a load of leading power factor, the full- load secondary voltage of a transformer is **greater than** its no load voltage.
92. A 100KVA transformer has full- load Cu loss of 1600W and iron loss of 900W. It will have a maximum efficiency for a load of **75 KVA**.
93. A 230/460 V transformer has a primary resistance of 0.2 ohm and reactance of 0.5 ohm and the corresponding values for the secondary are 0.75ohm and 1.8ohm respectively. The total voltage drop in the secondary when supplying 10A at 0.8p.f. Lagging is **35.2V**.
94. In the above question **-10.4V** will be the voltage drop if the p.f. is 0.8 leading.
95. The low voltage winding of a 300KVA, 11000/2200V, 50Hz transformer has 190 turns and resistance of 0.06 ohm. The high voltage side has 910 turns and a resistance of 1.6 ohm. When low voltage winding is short circuited, the full load current is obtained with 550V applied to h.v.side. **2.98ohm** is the equivalent referred to high voltage side
96. In the above question, **19.5 ohm** is the equivalent leakage reactance referred to high voltage side; assume full load efficiency of 95.5%.
97. In a 50KVA transformer, the iron loss is 500W and full load Cu loss is 800W. The set efficiency of the transformer at full load at 0.8 p.f. lagging is **96.85%**.
98. In above question, **96.6%** is the efficiency of the transformer at half load at 0.8 p.f. lagging.
99. A 40KVA transformer has iron loss of 450W and full load copper loss of 850W. If the power factor of the load is 0.8 lagging, the full load efficiency of the transformer is **96.1%**.
100. In the above question, **29.1KVA** is the load at which maximum efficiency occur.

101. in question 99, **96.28%** is the maximum efficiency of the transformer
135. A 440/110V transformer has a primary resistance of 0.03ohm and secondary resistance of 0.02 ohm. Its iron loss at normal input is 150W. The secondary current at which maximum efficiency will occur is **82.58%**
102. In the above question **96.8%** is the maximum efficiency at a unit p.f load.
103. A 200/400V, 10KVA, 50 Hz single phase transformer has a full load, a copper loss of 120W. If it has efficiency of 98% at full load, **84W** is the iron loss.
104. In the above question, **97%** will be the efficiency of the transformer at a half load at 0.8 p.f. lagging.
105. **Current transformer** should never have the secondary open circuited while primary is energized.
106. **95%** is the approximate efficiency of the large transformer.
107. **Air cooled** is the transformers generally cooled for installation rated at less than 5KVA.
108. An isolation transformer has a primary to secondary turn's ratio of **1:1**.
109. The load on a transformer is $2 < 0^0$ ohm or $2 < 20^0$ ohm. The efficiency of the transformer will be **greater than for a load of $2 < 0^0$ ohm**
110. A 3 phases, 50Hz transformer has a delta connection primary and star connected secondary; the line voltage being 22000V and 400V respectively. The secondary has a star connected balanced load 0.8 p.f. lagging. The line current on the primary side is 5A. **275A** is the secondary phase current.
111. A transformer has 200 W as iron loss at full-load. The iron loss at half full – load.
The iron loss at half full-load will be **200w**.
112. In the above question, **152.4** is the output power.

Chapter 20

1. The stator of three phase induction motor produces ROTATING magnetic field.
 2. An induction motor is preferred to a dc motor because it HAS SIMPLE AND RUGGED CONSTRUCTION
- A 3 phase induction motor is ESSENTIALLY A CONSTANT –SPEED MOTOR
3. The air gap between stator and rotor of a 3 phase induction motor ranges from 0.4MM TO 4MM
 4. If the frequency of 3 phase supply to the stator of a 3 phase induction motor is increased then synchronous speed IS INCREASED
 5. If N_s is the speed of rotating flux and N is the speed of rotor , then the rate at which the flux cuts the rotor conductors is directly proportional to $N_s - N$
 6. In a 3 phase induction motor the rotor speed is SMALLER THAN the synchronous speed.
 7. The synchronous speed of a 3 phase induction motor having 20 poles and connected to a 50Hz source is 300 RPM
 8. The relation among synchronous speed (N_s), rotor speed(N) and slip(s) is $N = (1-s)N_s$
 9. When a 3 phase induction motor is at no load the slip is PRACTICALLY ZERO
 10. When the rotor of a three phase induction motor is blocked the slip is 1
 11. *The speed of rotating flux in figure 20-16 will be 1500 RPM
 12. *If the induction motor shown in fig 20-16 runs at 1450 rpm then slip is 3.3%
 13. In fig 20-16 the rotor frequency is when the motor is at standstill 50HZ
 14. *If one of the lines in fig 20-16 is interchanged then FLUX SPEED REMAIN SAME BUT DIRECTION IS REVERSED
 15. If a 4 pole induction motor has a synchronous speed of 1500 rpm then supply frequency is 50HZ
 16. The full load slip of a 3 phase induction motor ranges from 2% TO 5%
 17. The direction of rotation of field in a 3 phase induction motor depends upon PHASE SEQUENCE OF SUPPLY VOLTAGE
 18. The rotor winding of a 3 phase wound rotor induction motor is generally STAR connected
 19. 3 phase wound rotor motors are also called SLIP RING motors
 20. The advantage of wound rotor motor is that EXTERNAL RESISTANCE CAN BE INSERTED IN THE ROTOR CIRCUIT
 21. A wound rotor motor is mainly used in applications where HIGH STARTING TORQUE IS REQUIRED
 22. The torque characteristics of a 3 phase induction motor is similar to that of D.C SHUNT MOTOR
 23. In a wound rotor motor, the rotor winding is wound for poles that EQUAL TO that of stator winding
 24. Wound rotor motors are less extensively used than squirrel cage motors because THEY ARE COSTLY AND REQUIRE GREATER MAINTENANCE
 25. A 4 pole 50 Hz induction motor operates at 5% slip. The frequency of emf induced in the rotor will be 2.5 HZ
 26. The maximum voltage is induced in the rotor of a 3 phase induction motor when it IS BLOCKED
 27. The reactance of the rotor circuit of a 3 phase induction motor is maximum at STARTING
 28. The rotor current in a 3 phase induction motor is DIRECTLY PROPORTIONAL to slip
 29. At starting ,rotor reactance of a 3 phase induction motor is LARGE as compared to rotor resistance

30. When an induction motor is running at full load ,rotor reactance is COMPARABLE TO rotor resistance
31. If the slip of a 3 phase induction motor increases the p.f of the rotor circuit IS INCREASED
32. The magnetizing current drawn by a 3 phase induction motor is about 30 TO 50% of full load stator current
33. A high starting torque can be obtained in a 3 phase induction motor by INCREASING ROTOR RESISTANCE
34. The starting torque of a 3 phase induction motor is DIRECTLY PROPORTIONAL TO SQUARE OF supply voltage
35. The starting torque of an induction motor is maximum when rotor resistance per phase is EQUAL TO rotor reactance per phase
36. Under running condition ,the maximum torque of a 3 phase induction motor will occur at that value of slip at which rotor resistance per phase is EQUAL TO rotor reactance per phase
37. The maximum torque of a 3 phase induction motor under running condition is INVERSELY PROPORTIONAL TO ROTOR REACTANCE AT STANDSTILL
38. If the supply voltage of a 3 phase induction motor is increased two times then torque is INCREASED FOUR TIMES
39. The 3 phase induction motor is so designed so that the should have LOW RESISTANCE under running condition
40. If a 3 phase induction motor is running at slip s , then rotor copper losses is equal to $S \cdot \text{ROTOR INPUT}$
41. If an induction motor is running at slip s , then rotor output is $(1-S) \cdot \text{ROTOR INPUT}$
42. If N_s and N are the speeds of rotating field and rotor respectively ,the ratio rotor input/rotor output is equal to N_s/N
43. At no load the rotor core loss of a 3-phase induction motor is PRACTICALLY ZERO
44. Friction and windage loss of a 3- phase induction motor are MAXIMUM AT NO-LOAD
45. For higher efficiency of a 3-phase induction motor, the slip should be AS SMALL AS POSSIBLE
46. If a 3 phase induction motor is running at a slip S , then approximate efficiency of the motor is $1-S$
47. A 3-phase induction motor is running at a 2%slip, if the input to rotor is 1000w ,then mechanical power developed by the motor is 980W
48. The approximate efficiency of a 3 phase 50Hz ,4 pole induction motor running at 1350 rpm is 90%
49. In a squirrel cage rotor ,the bars are not placed parallel to the shaft but are skewed to have UNIFORM TORQUE
50. In a squirrel cage motor ,the number of stator slots is EITHER MORE OR LESS THAN THE NUMBER OF rotor slots
51. If the air gap between the rotor and stator of a 3-phase induction motor is increased then LEAKAGE REACTANCE ARE INCREASED
52. If the slip of induction motor increases ,then current in the stator winding IS INCREASED
53. The conditions of an induction motor at no load resemble those of a transformer whose secondary is OPRN-CIRCUITED
54. The condition of an induction motor at standstill resemble those of a transformer whose secondary is SHORT-CIRCUITED

55. The condition of an induction on load resemble those of a transformer whose secondary is SUPPLYING A VARIABLE RESISTIVE LOAD
56. The speed of a squirrel cage induction motor is changed by POLE CHANGING
57. One of the speeds of a 2-speed squirrel cage induction motor is 800 r.p.m The other speed will be 1600 RPM
58. A four speed squirrel cage induction motor, uses TWO stator windings
59. In a double squirrel cage induction motor the outer cage winding has HIGH RESISTANCE
60. At starting of a double squirrel cage induction motor OUTPUT CAGE WINDING HAS GOOD POWER FACTOR
61. Very large 3-phase induction motors(>25HP) are started BY AUTO TRANSFORMER STARTING
62. If the rotor slots are made deeper, the rotor resistance is INCREASED AT STARTING
63. In a squirrel cage induction motor ,the number of rotor bars is generally PRIME NUMBER
64. In a squirrel cage induction , the maximum torque developed under running condition is MUCH HIGHER THAN FULL LOAD TORQUE
65. In a wound rotor induction motor, the external resistance is so adjusted in the rotor circuit that maximum torque developed is EQUAL TO ITS STARTING TORQUE
66. For the same KVA rating , the leakage flux in induction motor is that of transformer MORE THAN
67. An 8 pole alternator runs at 750 rpm and supplies power to a 6 pole induction motor which has a full- load slip of 3% .The full load speed of the motor is 970 RPM
68. In the above question what is the frequency of rotor emf? 1.5 HZ
69. What is the approximate efficiency of a 60 Hz, 6 pole 3 phase induction motor running at 1050 rpm? 87.5%
70. A 3-phase , 6 pole induction motor is connected to a 60 Hz supply. The voltage induced in the rotor bars in 4V when the rotor is at stand still .The voltage induced in the rotor bars at 300 r.p.m is 3V
71. A 3-phase induction motor is connected to a supply of normal voltage . The emf induced between the slip rings at standstill is 72v and the resistance and standstill reactance/phase are 0.5ohm and 3.5 ohm respectively .The rotor is star connected .The rotor phase current at starting when the rings are short-circuited is 11.76A
72. In the above question , what is the rotor power factor ? 0.14 LAG
73. In Q72. The rotor is joined to a star connected resistance of a 4ohm /phase .The rotor phase current at starting will be 7.3A
74. A 3-phase ,400 V wound rotor motor has delta –connected stator winding and star connected rotor winding .The stator has 48 turns/phase while the rotor has 24 turns/phase .The standstill voltage across the slip rings is 346V
75. A 6 pole ,3-phase induction motor is connected to a 25Hz supply and at full load the rotor e.n.f makes 105complete cycles in 2 minutes .The full load percentage slip is 3.5%
76. In the above question ,the full load rotor speed is 482RPM
77. The starting torque of a 3-phase induction motor has maximum value .The rotor power factor is then 0.707LAG
78. A 50 hz 8 pole ,3 phase induction motor has full load slip of 4%.The rotor resistance and standstill reactance per phase are 0.01ohm and 0.1ohm respectively .The speed at which the maximum torque occur is 675 RPM
79. In the above question , the ratio of maximum torque to full load torque is 1.45

80. A 12-pole, 3-phase, star-connected induction motor runs at 600 V, 50 Hz. It has a rotor resistance of 0.03 ohm/phase and standstill reactance of 0.5 ohm/phase. The slip corresponding to maximum torque under running condition is 6%
81. In the above question, the speed of motor at maximum torque is 470 RPM
82. A 3-phase induction motor has a 4-pole star-connected stator winding and runs on a 220V, 50 Hz supply. The rotor resistance is 0.1 ohm/phase and standstill reactance is 0.9 ohm/phase. The ratio of stator to rotor turns is 1.75. The full load slip is 5%. The full load motor impedance per phase is 4.22 A
83. In the above question, what will be the current per phase in the rotor when running short-circuited with 4% slip? 2.22 A
84. A 3-phase induction motor has a 4-pole star-connected stator winding and runs on a 220V, 50 Hz supply. The rotor resistance is 0.1 ohm/phase and standstill reactance is 0.9 ohm/phase. The ratio of stator to rotor turns is 1.75. The full load slip is 5%. The full load rotor impedance per phase is 2.19 OHM
85. *In the above question, what is the rotor current/phase? 33.14 A
86. In Q.85 the rotor input is? 6589 W
87. In Q.85 what is the speed at maximum torque? 1333 RPM
88. An 8-pole, 50 Hz, 3-phase induction motor has an equivalent rotor resistance of 0.07 ohm/phase. If its stalling speed is 630 r.p.m. what is the rotor reactance per phase? 0.44 OHM
89. *In the above question, how much resistance must be included per phase to obtain maximum starting torque? 0.37 OHM
90. The input to a 3-phase induction motor is 50 kW. The stator losses amount to 800 W. The rotor copper loss per phase is (slip=3%) 492 W
91. In the above question what is the mechanical power developed? 64 H.P
92. An eight-pole 3-phase, 50 Hz induction motor running with a slip of 4% is taking 20 kW. Stator losses amount 0.5 kW. The total torque developed is 248 Nm
93. In the above question, if the mechanical torque lost in frictions is 16 Nm. What is the B.H.P 23.44
94. A 3-phase, 500V, 50 Hz induction motor with 6 poles develops 20 B.H.P at 950 r.p.m with a power factor of 0.86 lagging. The mechanical losses amount to 1 H.P. For this load rotor copper loss is 825 W
95. *In the above question, if the stator losses are 1500 W, the line current is 24 A
96. A 6-pole, 3-phase induction motor runs at a speed of 960 r.p.m and the shaft torque is 135.7 Nm. Calculate the rotor copper loss if the friction and windage losses amount to 150 W. The supply frequency is 50 Hz. 574 W
97. A 3-phase, 6-pole, 50 Hz induction motor delivers 3.73 kW at 950 r.p.m. What is the stator loss is 250 W? 4180 W
98. A 7.46 kW, 230V, 3-phase, 50 Hz, 6-pole squirrel-cage induction motor operates at a full-load slip of 4% when rated voltage and rated frequency are applied. The speed of rotation of the stator m.m.f is 1000 RPM
99. *In the above question, what is the full-load speed? 960 RPM
100. In Q.99 what is the full load torque? 74.2 Nm
101. The power input to the rotor of a 440V, 50 Hz, 6-pole, 3-phase induction motor is 80 kW. The rotor e.m.f is observed to make 100 complete cycles per minute. What is the slip? 3.3%
102. *In the above question, what is the mechanical power developed? 103.6 H.P

103. In Q102, what is the rotor Cu loss per phase? 880W
104. In q 102 what is the rotor resistance per phase if the rotor current is 65A? 0.208 OHM
105. A 12-pole ,3- phase alternator is coupled to an engine running at 500 r.p.m. The alternator supplies a 3-phase induction motor which has full load speed of 1440 r.p.m.The number of poles of the motor is 4
106. A 100 H.P motor with a synchronous speed of 750 r.p.m at 50 Hz has 96stator slots with 4 conductors per slot and 120 rotor slots with 2 conductors per slot .If the full load efficiency is 0.92 lagging , the current per phase when the stator is star-connected(rotor is wound 3-phase)to 3-phase,500v supply will be 104 A
107. In the above question, the number of stator turns per phase is 64
108. A25 H.P,6pole ,50Hz slip-ring induction motor runs at 960r.p.m at full-load with a rotor current of 35A. The copper loss in the short-circuiting gear is 230w and mechanical losses amount to 1000w.The total mechanical output is 19900W
109. In the above question , what is rotor copper loss?829W
110. In Q109 what is the resistance per phase of the 3-phase rotor winding?0.157 OHM
111. A 3-phase induction motor with a synchronous speed of 1000 r.p.m .develops 5 mechanical H.P at 935 r.p.m .what is the stator input if the stator loss is 400W? 4.4KW
112. In the above question ,if a rheostat be included in the rotor circuit so that connected mechanical power is 6 H.P at 750 r.p.m. what is the stator input? Assume that rotor(not sure) losses are doubled 6.77KW
113. The efficiency of an induction motor CANNOT BE GREATER THAN 1-S
114. An induction motor is so called because its operation depends upon MUTUAL INDUCTION
115. In an induction motor the ratio of ,rotor Cu loss and rotor input is given by S
116. The no-load speed of an induction motor depends upon THE SUPPLY FREQUENCY AND THE NUMBER OF ITS POLES
117. The induction motor has lagging power factor during BOTH STARTIND AND OPERATION
118. The frequency of rotor current in a 6-pole 50Hz, 3-phase induction motor running at 950 r.p.m is 2.5HZ
119. The rotor of induction motor ALWAYS REVOLVES IN THE DIRECTION OF STATOR FLUX

Vk mehta chapter#21

a single phase induction motor employees roter**squirrel cage**

for the same rating of the size of single phase induction motor is about..... that responding 3 phase induction motor**1.5 times**

for the same rate in the power factor of single phase induction motor is that of single phase induction motor..... **less than**

for the same rating the efficiency of single phase induction motor isthat of 3 phase induction motor..... **less than**

most of single phase induction motor Are.... machine**4 pole**

the main winding and starting winding of a single phase induction motor are connected in across the supply..... **parallel**

the starting winding of single phase induction motor has that of main winding..... **same number of pole as**

a 50 hertz 4 pole single phase induction motor will have a synchronous speed of..... **1500 RPM**

a 4 pole 50 hertz single phase induction motor has a slip of 5% the speed of motor will be..... **1425 RPM**

in a single phase induction motor speed sensitive centrifugal switch is connected in winding**series with starting winding**

the purpose of starting winding in single phase induction motor is to..... **produce rotating flux in conjunction with main winding**

if I_m and I_s are currents in the main and starting windings respectively and α is the angle between I_m and I_s then motor torque is given by T is**directly proportional to $I_s I_m \sin \alpha$**

a resistance split phase induction motor is used for**low inertia loads**

the direction of split phase induction motor can be reversed by interchanging the connection of the supply ofeither main or starting winding

resistance split phase induction motor has starting torque**moderate**

the resistance split phase induction motor is used in those application where starting is..... **infrequent**

the resistance split phase induction motor are the most popular single phase motor because of**their low cost**

at starting the line current of capacitor start induction motor isthe normal full road current.....**4 to 5 times**

in a capacitor start capacitor run motor winding is cut cut after starting**neither starting nor main**

a capacitor start capacitor run motor has**high power factor**

the capacitor start capacitor run induction motor act as a true 2phase motor..... **at full load**

the capacitor start capacitor run motor is used in those applications we are.... **silence is importance**

the capacitor start capacitor run motor has no..... **centrifugal switch**

capaster Motors Resistance phase induction motor**are costlier than**

most of the troubles in single phase induction motor are able to the**starting switch**

this single phase shaded pole motor has **squarrel cage rotor**

the direction of rotation of shaded pole motor depends upon**which half of pole is shaded**

the full load efficiency of shaded pole motor is..... **about 30% to 35 %**

the single-phase series motor can operate only on..... **both AC and DC**

for the same rating a DC series motor costa single phase series motor.. **less than**

A 2 HP DC series motor weigh.....with 2 HP single phase series motor.....**less than**

a vacuum cleaner employs..... motor..... **single phase series motor**

the best suited motor to drive 1/4 HP fann in hospital ward will be motor**capacitor run motor**

the washing machine journal employees ... motor**resistance split phase**

motor the best suited motor to drive 3/4 HP air compressor would be days motor..... **capacitor start**

the least expensive functional horsepower motor is motor**shaded pole**

A 4 pole 50 hertz single phase induction motor is running with a slip of 3.4 % the speed of motor is.....
1449 RPM

a single phase induction motor runs normally at 1125 RPM on 60 hertz power supply how many Pol must have.....**6**

if a single phase motor Run normally 183 Radian per second on 60 Hz power supply how many poles mat must have**4**

in a split phase induction motor the two stator windings are**mutually dispatched by 90 degree electrical**

is compare two capacitor start induction motor are split phase motor a permanent split capacitor motor has lower**noise**

which of the following single phase motor is available with speed as low as one Revolution per month**shaded pole**

Chapter# 22 (V.K Mehta)

- 1: Majority of alternators in the use have **revolving field type construction.**
- 2: The stator of an alternator is identical to that of a **3-phase induction motor.**
- 3: The stator of an alternator rarely uses **closed type** slots.
- 4: The field winding of an alternator is **d.c** excited.
- 5: The a.c armature winding of an alternator operates at **much higher voltage than** the field winding.
- 6: The salient-pole construction for field structure of an alternator is generally used for **8-pole** machine.
- 7: An alternator is sometimes called **synchronous** generator.
- 8: A turbo-alternator uses **non-salient-pole field structure.**
- 9: The non-salient-pole field construction is used for **high-speed** alternator.
- 10: The a.c armature winding of an alternator is **always star connected.**
- 11: Low speed alternators are driven by **hydraulic turbines.**
- 12: High-speed alternators are driven by **steam turbines.**
- 13: The airgap in an alternator is **much longer than** in an induction motor.
- 14: The stator of an alternator is wound for **the same number of poles as** on the rotor.
- 15: Turbo-alternators have rotors of **small diameter and long axial length.**
- 16: The rotor of a turbo-alternator is made cylindrical in order to reduce **winding losses.**
- 17: The number of cycles generated in a 6-pole alternator in one revolution is **3.**
- 18: The speed at which a 6-pole alternator should be driven to generate 50 cycles per second is **1000 r.p.m.**
- 19: The frequency of e.m.f generated in an 8-pole alternator running at 900 r.p.m. is **60Hz.**
- 20: In case of a 4-pole machine, 1 mechanical degree corresponds to **2** Electrical degrees.
- 21: For the same rating, the size of low speed alternator is **more than** that of high-speed alternator.
- 22: The synchronous reactance of an alternator is due to **armature reaction.**
- 23: The synchronous reactance of an alternator is generally **10 to 100 times greater than** armature resistance.
- 24: The synchronous of an alternator **decreases** as the iron is saturated.
- 25: In an alternator, the effect of armature reaction is minimum at power factor of **unity.**

- 26: If the lagging load p.f of an alternator is decreased, the demagnetizing effect of an armature reaction **is increased**.
- 27: A 3-phase alternator generates an open circuit phase voltage of 4000 V when exciting current is 50A; the short circuit current for the same excitation being 800 A. The synchronous reactance per phase is **5 ohm**.
- 28: A 30 MVA, 15 KV alternator will have a per phase nominal impedance of **7.5 ohm**.
- 29: When load on an alternator is increased, the terminal voltage increases if the load p.f is **leading**.
- 30: The efficiency of the turbo-alternator **increases** with the increase in speed.
- 31: The full load efficiency of an alternator **increases** with the size of the machine.
- 32: For the same power rating, an alternator is **smaller in size than** of a generator.
- 33: In the armature winding of an alternator, the coil span falls short of full-pitch by 60 degrees (electrical). The pitch factor is **0.866**.
- 34: A 3-phase alternator has 3-slot per pole. The distribution factor of the winding is **1**.
- 35: The disadvantage of a short pitch coil is that **voltage round the coil is reduced**.
- 36: The voltage regulation of an alternator for a p.f of 0.8 lagging is **greater than** at the unity.
- 37: The voltage regulation of an alternator is larger than that of a d.c generator because of **complex effects of armature reaction**.
- 38: The per phase d.c armature resistance of an alternator is 0.5 ohm. The effective a.c armature resistance would be about **0.75 ohm**.
- 39: The d.c armature resistance of a Y-connected alternator measured across its two terminals is 0.5 ohm. The per phase resistance is **0.25 ohm**.
- 40: The d.c armature resistance of a delta-connected alternator measured across its two terminals is 1 ohm. The per phase d.c resistance is **1.5 ohm**.
- 41: An under-excited alternator supplies **leading VAR**.
- 42: If the excitation of an alternator operating in parallel with other alternators is decreased, its **p.f becomes more leading**.
- 43: The distribution of load between two alternators operating in parallel can be changed by changing **driving torques of prime movers**.
- 44: When a number of alternators are operating in parallel, the power factor at which each operates is determined by **its field excitation**.
- 45: If the excitation of an alternator operating in parallel with other alternators is increased above the normal value of excitation, its **p.f becomes more lagging**.

- 46: The voltage of the bus-bar to which several alternators are paralleled may be raised by simultaneously **increasing field excitation** of all alternators.
- 47: The frequency of the system with which several alternators are paralleled can be increased by simultaneously **increasing the speed of prime movers** of all generators.
- 48: The alternators driven by **steam turbines** do not have a tendency to hunt.
- 49: Damper windings are used in alternators to **prevent hunting**.
- 50: The rating of an alternator is expressed in **KVA**.
- 51: A 3-phase, 16-pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 30mWb sinusoidally distributed and the speed is 375 r.p.m. The frequency of generated e.m.f is **50 Hz**.
- 52: In the above question, the line e.m.f. is **2770 V**.
- 53: When the speed of an alternator is reduced by half, the generated e.m.f will become **half**.
- 54: The magnitude of e.m.f. generated by an alternator depends on **number of poles, rotor speed** and **flux per pole**. (All of the above)
- 55: Voltage drop in an alternator when under load is due to **armature resistance, armature reactance** and **armature reaction**. (All of the above)
- 56: For producing an e.m.f. of given frequency, an alternator will run at greatest speed for **2** poles.
- 57: An alternator supplying power to a load with a leading power factor always has **Negative** voltage regulation.
- 58: A two-pole alternator is running at 1500 r.p.m. Its angular velocity is **157 radians per second**.
- 59: A 5000 KVA, 1100 V, 50 Hz Y-connected 3-phase alternator has armature resistance of 0.1 ohm per phase and synchronous reactance per phase of 1.5 ohm, has a generated e.m.f. of **769.2 V** per phase.
- 60: In the above question, the voltage regulation is **21.1%**.
- 61: In Question no 59, if the load p.f is 0.9 lagging, the voltage regulation is **41.4%**.
- 62: In Question no 59, if the p.f is 0.8 leading, the voltage regulation is **-15.9%**.
- 63: If the number of poles of an alternator is increased, the generated e.m.f **increases**.
- 64: A Y-connected, 3-phase alternator is adjusted to its rated line-to-line voltage of 230 V while under its rated load and at 80% lagging power factor. The same field excitation current results in a no-load line-to-line voltage of 328.6 V. The voltage regulation is **42.8%**.
- 65: The above alternator has a rated voltage of 100% while carrying an 80% lagging power factor load at 100% current. If its no-load voltage is 142.8% of the rated voltage, the voltage regulation of the alternator is **42.8%**.

66: A Y-connected three-phase alternator is delivering power to a three-phase line. The line-to-line voltage is 460 V. The line current are 7.73 A and the total wattage is 5.12 KW. The load factor is **83.1%**.

67: If the line-to-line voltage in the above question rises to 618 V at no load with the same excitation, then voltage regulation of the alternator is **34.3%**.

68: A voltage regulation test is to be performed on a 3-phase Y-connected alternator. Its line-to-line drop is taken with a d.c supply to find its armature circuit resistance. The readings are: d.c voltage drop = 11.15 V and line current = 18.5 A. The d.c resistance per phase is **0.301 ohm**.

69: In the above question, per phase a.c armature resistance is **0.452 ohm**.

70: A synchronous impedance test is taken on the alternator of Question no 68, Under short-circuit conditions, the line current is 18.67 A. The line-to-line voltage on open-circuit test for the same excitation is 240.3 V. The synchronous impedance is **7.43 ohm**.

71: The losses in an alternator are the same as in **a d.c machine**.

72: For a given load, the efficiency of an alternator is maximum at **1 p.f.**

73: Iron and friction losses of an alternator can be measured by **a d.c motor**.

74: Copper losses of an alternator can be measured by **a d.c motor**.

75: The Voltage regulation of an alternator depends on **both load current and p.f.**

76: A 50 KVA, 500 V, single phase a.c generator gave the following test results ;

Open Circuit test: A field current of 12 A produced an e.m.f of 300 V.

Short circuit test: A field current of 12 A caused a current of 175 A to flow in the short-circuited armature.

The synchronous impedance of the generator is **1.71 ohm**.

77: In the above question, if the effective armature resistance is 0.2 ohm, the synchronous reactance is **1.69 ohm**.

78: In Question no 76, if the a.c generator is to supply full load current of 100 A at unity p.f., to what value the terminal voltage would rise if the load were removed.? **546.7 V**.

79: Armature windings of an alternator are generally **open windings**.

80: Majority of the alternators are **Three phase**.

Chapter 23

1. The rotor of a synchronous motor is **salient-pole type**
2. Damper winding in a synchronous motor **serves to start the motor**
3. Small synchronous motors are started by **damper windings**
4. A synchronous motor runs at speeds ranging from **150 to 1800rpm**
5. The full-load slip of a synchronous motor is **zero**
6. A 50Hz synchronous motor runs at 200rpm. The number of salient poles is **30**
7. If the supply frequency of synchronous motor is 60cycles/sec: then the rotor must revolve at **60cycles/sec**
8. A synchronous motor is a **variable pf motor**.
9. The rotor of a synchronous motor is excited with direct current when the motor approaches **synchronous speed**
10. When the synchronous motor at synchronous speed the voltage induced in the damper winding is **zero**
11. To reverse the direction of a synchronous motor **interchange any two stator lines**.
12. A synchronous motor runs at only one speed because it is a **doubly fed machine**.
13. The speed of a synchronous motor can be changed by varying **supply frequency**.
14. If a synchronous motor is operating at the 50cycles/sec the rotor revolves **50cycles/sec**.
15. When the motor is on no load. The axes of the rotor poles **nearly coincide with** stator poles.
16. If the mechanical angle α between the rotor and stator poles increases, then stator current **increases**.
17. The increased load demand in a synchronous motor is met by **relative shift between stator and rotor poles**.
18. The pull-out torque of a practical synchronous motor is will occur when the torque angle is about **75degrees**
19. The pull-out torque of a synchronous motor is generally **1.25 to 1.35** times its full load.
20. The pull-out torque of a synchronous motor will **increase** as the field excitation increases.
21. The change of load on synchronous motor will not result in the change of **speed**.
22. For a given load, the normal field excitation of synchronous motor is that at which gives **unity** power factor
23. For a given load, the armature current of a synchronous motor will be minimum for **unity** power factor.
24. For a given load, if the field excitation of a synchronous motor is increased then, armature current **increases**.
25. An over excited synchronous motor behaves as **capacitor**.
26. An under excited synchronous motor behaves as an **inductor**.
27. A synchronous motor will be more stable in its operation when it is operated at **leading pf**.
28. When the synchronous motor is on no load the torque angles is about **0 degrees** electrical.
29. At full load, the rotor poles of a synchronous motor are displaced by a mechanical angle of 1 from their no-load position. If the machine has 40 poles, then torque angle os **20 degrees electrical**.
30. When the pull-out torque occurs in a synchronous motor, the poles of the rotor are **mid-way between N and S poles of stator**.
31. The mechanical power developed by a synchronous motor is **directly proportional to** stator voltage.

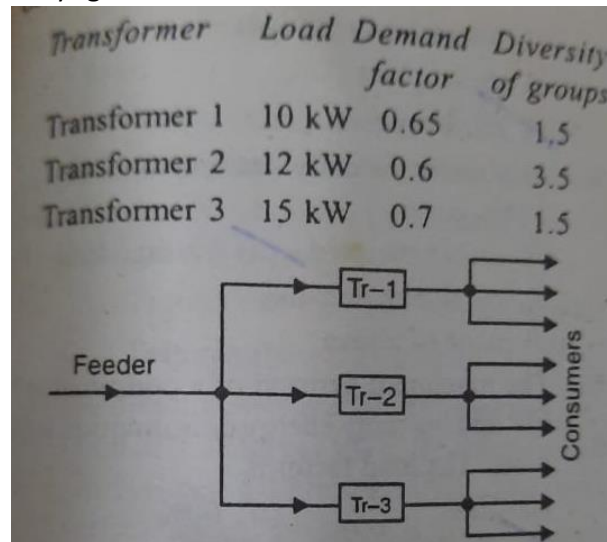
32. The mechanical power developed by a synchronous motor is independent of **speed**.
33. When a synchronous motor is pulled out of synchronism, the stator current is **increased too much**.
34. Most of the synchronous motors are **unity** pf motors.
35. A synchronous capacitor is an over excited motor running at **no-load**.
36. A synchronous motor delivers reactive power when **over-excited**.
37. Leading power factor synchronous motors cost **more than** the unity pf motors.
38. When a unity pf synchronous motor is operated at a leading pf it results in **more than rate stator current**.
39. The power factor correction capability of a loaded synchronous motor **decreases** with the increase in mechanical load
40. The capacity of a synchronous capacitor is generally in the range of **MVAR**.
41. The size of a synchronous motor is determined by **KVA Rating**.
42. For the same horsepower output, the efficiency of a synchronous motor is **lesser than** that of 3-phase induction motor.
43. A synchronous motor is cheaper than 3-phase induction motor for **low speed high output**.
44. For the same active power consumed, a synchronous motor draws **less apparent power than** the 3-phase induction motor.
45. For the same active power consumed, a stator current of a synchronous motor is **less than** the 3-phase induction motor.
46. synchronous motor are generally used in application requiring **infrequent starting**
47. For reciprocating compressor, the synchronous motor is designed to have pull-in torque of about **0.5 times** the full load torque.
48. For the same active power consumed, the losses in the stator winding of a synchronous motor are **less** that of a 3-phase induction motor.
49. In a synchronous motor, the magnitude of stator back emf depends on **dc excitation only**.
50. While running, a synchronous motor is compelled to run at synchronous speed because of **magnetic locking between stator and rotor poles**.
51. A 3-phase synchronous motor has 12 poles operates at 440V 50Hz supply, the speed of motor is **500rpm**.
52. In the above question if the motor takes a line current of 100A at 0.8pf leading, what torque motor is developing **1165Nm**.
53. A 4-pole 75KW, 3phase Y-connected 50Hz 440V synchronous motor operates at rated condition with 0.8pf leading. The motor efficiency excluding field and stator losses is 95% and $X_s=2.5\text{ohm}$. What is the mechanical power developed **78950W**.
54. In Q53 the armature current is **129A**
55. In Q53 the power angle is **-30degrees**
56. In Q53 maximum pull out torque is **1000Nm**.
57. In synchronous motor, the rotor CU losses are met by **dc source**.
58. If load angle of a 4-pole synchronous motor is 8 degrees electrical its value in mechanical degrees is **4**.
59. The direction of rotation of a synchronous motor can be reversed by **supply phase sequence**.
60. The effect of increasing load on a synchronous motor running with normal excitation is to **increase Ia but decrease pf**.

61. When load on a synchronous motor is increased, its armature current is increased provided, it is **all excitation conditions.**
62. When load on a synchronous motor running with normal excitation is increased, armature current drawn by it increases because **net resultant voltage E_f in armature is increased.**
63. A 18.65kW 220v 50Hz 4-pole Y-connected synchronous motor is running with a light load. The load angle is 4 degree electrical and back emf generated per phase is 110V. If the armature resistance per phase is 0.1 ohm and synchronous resistance per phase is 1.5V then resultant armature voltage per phase is **18.9V.**
64. In Q63, armature current per phase is **12.6A.**
65. In Q63, the pf of the motor is **0.46lag.**
66. In Q63, the power input to the motor is **2210W.**
67. In Q63, the gross torque developed by the motor is **13.8N-m.**
68. An over-excited synchronous motor running in parallel with induction motors can be used to improve the power factor of **all of these: supply line, generators, transformer.**
69. The maximum value of torque angle in a synchronous motor is **90 degrees electrical.**
70. Synchronous capacitor is **an over-excited synchronous motor running without mechanical load.**

Chapter 24 Generation of Electrical energy

1. The Primary Source of energy is **Sun**
2. The basic unit of energy is **Joule**
3. An alternator converts **mechanical energy into electrical energy**
4. 1kwh = **860 k cal**
5. The most clean power plant is **Hydroelectric plant**
6. The major heat lose in a steam power station occurs in **condenser**
7. The thermal efficiency of a steam power station is about **28%**
8. The overall efficiency of a steam power station is overall efficiency = thermal efficiency * **electrical efficiency**
9. The cheapest plant in operation and maintenance is **hydroelectric plant**
10. diesel power plants are used as **standby** by plants
11. the cost of fuel transportation is minimum in **hydroelectric plant**
12. The thermal efficiency and electrical efficiency of a steam power station are 30% and 92% respectively. the overall efficiency of station is **27.6%**
13. A steam power generation has an overall efficiency of 20 %. 0.6 Kg of coal is burnt per kWh of electrical energy generated. the calorific value of fuel **7166.67 KCal / Kg**
14. A thermal power station has boiler efficiency of 85% and turbine efficiency of 90 %. the thermal efficiency of the station is **76.5%**
15. A hydroelectric plant is supplied from a reservoir of capacity 5×10^6 cubic meters at a head of 200 meters. the overall efficiency of the plant is 75% the total electrical energy available is **2.044×10^6 kwh**
16. In a hydroelectric project catchment area equal to 5×10^9 meter square annual rain fall equal to 1.25 meter and yield factor equal to 80% the volume of water which can be utilized per annum is **5×10^9 meter cube**
17. The overall efficiency of a stem power station is **less than** its thermal efficiency
18. Mechanical energy is supplied to a dc generator a rate of 4200 joule per second the generator delivers 32.2 amp at 120V the efficiency of generator is **92%**
19. A thermal station has a maximum demand of 20000 kw and a load factor of 40% units generated per annum will be **7008×10^4 kwh**
20. It has be estimated that a minimum run off of approximately 94 meter cube per sec will be available are hydraulic project with ahead of 39 meter the efficiency of the plant is 80% . the firm capacity of plant is **28770kw**
21. In the above question the yearly output (kwh) of the plant is **252×10^6 kwh**
22. In the hydroelectric power station the penstock turbine and generator efficiency are respectively 95% ,90% and 85% the overall efficiency of the plant is **72.6%**
23. A factory is located near a water fall where the useable head for power generation is 25 meter the river flow is 10 meter cube per second the power develop is (plant efficiency = 80%) **1962kw**
24. It he above question if the river flow is 1.5 meter cube per sec the power developed is **294kw**
25. The highest point on the daily load curve represents **maximum demand**
26. Load factor, maximum demand ,average load are related as **Load factor = average load / maximum demand**
27. A generating station has a connected load of 43 mwh a maximum demand of 20mwh the units generated being 61.5×10^6 kwh per annum the demand factor is **0.465**

28. In the above question the load factor is **35.1%**
29. A generating station as an average demand of 15mwh. if the plant capacity factor is 50 % the plant capacity is **30mwh**
30. In the above question if the load factor 60% the reserve capacity of the plant is **5mwh**
31. A dispel station supplies the following loads to various consumers industrial consumer =1500kw, commercial load =75kw, domestic power =100kw, domestic light=450kw. If the maximum demand on the station is 2500kw than diversity factor is **1.12**
32. A power supply has domestic load having a maximum demand of 1500 kw if the diversity factor and demand factor are 1.2 and 0.8 respectively then connected domestic load is **2250kw**
33. The demand factor is generally **less than 1**
34. The load factor is generally **less than 1**
35. The diversity factor is always **greater than 1**



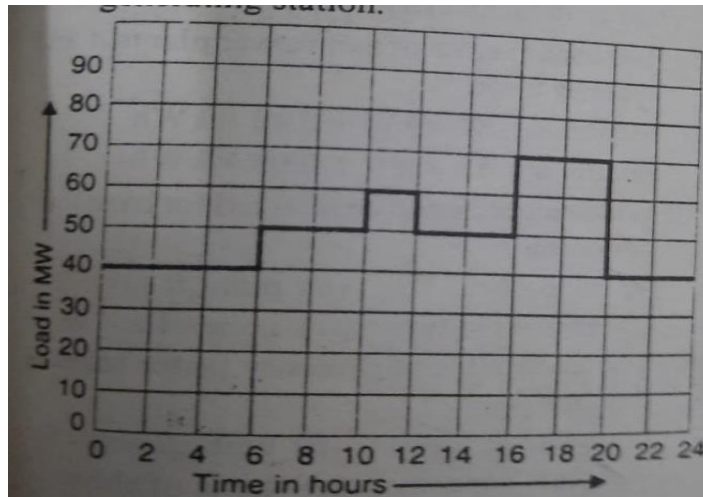
Fig

36. Fig shows a feeder supplying load to 3 distribution transformers each transformer supplies a group of customers how's connected loads are as above Fig
The maximum demand of Transformer one is **4.33kw**

Fig

37. In q 36 the maximum demand of transformer 2 is **less than** maximum demand on transformer 3
38. In Q 36 if the diversity facto among the transformer is 1.3 the maximum load on the feeder is **10.3 kw**

39. Fig show the daily load curve of a generating station



Fig

The maximum demand is **70MW**

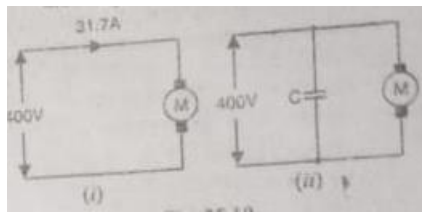
40. Referring to the daily load in above question units generated per day will be **$12 \cdot 10^5$ kwh**
41. Referring to daily load curve in Q 39 the average load is **50000 kw**
42. Referring to daily load curve in Q 39 the load factor is **71.4%**
43. If the maximum demand on the plant is equal to the plant capacity then the capacity of load factor is **equal to plant capacity factor**
44. If the load factor of a power station increases the cost per unit generated will **decrease**
45. If the diversity factor increase the maximum demand on the power station **decreases**
46. In a power station **reserve capacity = plant capacity – maximum demand**
47. A 100mw PowerStation delivers 100mw for 2 hours, 50mw for 6 hours and is shut down for the rest of each day it is also shutdown for maintenance for 45 days each year. energy supplied per year is **$16 \cdot 10^4$ mwh**
48. In a power system diversity factor **decreases** as we move from consumers to power station
49. There are no standby losses in **hydroelectric plant**
50. A power station has a maximum demand of 15000 kw the annual load factor is 50% and plant capacity factor is 40% the plant capacity is **18750kw**
51. In Q#50 the reserve capacity is **3750kw**
52. Ideal load factor should be **1**
53. The base load power station supplies **24 hours** in a day
54. The capacity of the power plant is generally made **15% to 20%** more than the maximum demand to meet the future load requirements
55. A base load station has a capacity of 18mw the annual output of the station is $101.35 \cdot 10^6$ kWh. The annual load factor of the station is **64.2%**
56. The cost of fuel transportation is minimum in **hydroelectric plant**
57. Of all the plants the minimum quantity of fuel required is in **nuclear power plant**
58. Area under the daily load curve divided by 24 hours gives **average load**
59. The maximum demand of a consumer is 2kw and his daily energy consumption is 20 units his load factor is **41.6%**
60. A diesel power station is generally used as **peak load station**
61. In an interconnected grid system the diversity factor of the whole system **increases**

62. The desirable qualities of the power system are **high load factor and diversity factor**
63. In inter connected grid system more efficient plant are used as **base load stations**
64. The annual cost if 2 power plants C and B are as under
 Station A = $80 \times kW + 0.02 \times kWh$
 Station B = $50 \times kW + 0.03 \times kWh$
Plant A should be selected for base load operation
65. The knowledge of diversity factor helps in determining **plant capacity**
66. In a thermal power station economisers are used to heat **feed water**
67. In a thermal power station super heater heats **steam**
68. For low head and large discharge the hydraulic turbine used is **Kaplan turbine**
69. A diesel power station has fuel consumption of 0.28kg/kwh the calorific value of fuel being 10000 kilo calories per kg the overall efficiency of the station is **30.7%**
70. In Q# 69 if the alternator efficiency is 95% the efficiency of the engine is **32.3%**
71. A diesel power station has a fuel consumption per day =1000kg and unit generated =4000kwh the specific fuel consumption is **0.25 kg per kwh**
72. A hydroelectric station has a catchment area of 4×10^8 meter square. the average rain fall per annum in this area is 125cm amusing that 30% of the rainfall is lost due to evaporation etc. the rate of availability of water is **11.1meter cube per sec**
73. To supply base load of a power station **nuclear power plant** is very suitable
74. To supply peak load of a power station **diesel power plant** is very suitable
75. The peak power supplied by peak load station is **very costly**
76. In hydroelectric power station the effective head is H meters and the rate of water flow is Q meter cube per sec the hydraulic power P available in kw is **$P=9.8QH$**
77. A large hydroelectric power station has head of 324meter and an average flow of 1370 meter cube per sec the reservoir has an area of 6400 km^2 the available hydroelectric power is **4350 mw**
78. A hydroelectric station is supplied from a catchment area of 150 km^2 with annual rain fall of 200 cm and effective head of 300 meter the yield factor is 60% the available power is **16787kw**
79. **Graphite** is used as a moderator in nuclear power station
80. Nuclear reactor utilize the process of **fission**

Chapter 25 Economics of Power consumption

1. when the load factor of a power station increases the units (kwh) generated **are increased**
2. The initial value of equipment is Rs 1000 and its scrap value after useful life is zero. The annual rate of depreciation is 10%.using diminishing value method ,the depreciation charge for the second year is **RS 900**
3. The fixed cost of energy generated independent of **maximum demand and units generated**
4. A consumer who consumes more electrical energy should pay **less fixed charges per unit**
5. The Drawback of diminishing value method for calculating depreciation is that depreciation charges **are independent of rate of interest**
6. A transformer costing Rs 90000 has a useful life of 20 year. if the scrap value of the equipment is Rs 10000 , the annual Deprecation charge using straight line method is **Rs 4000**
7. The equipment in a power station cost Rs 1560000 and has a salvage value of Rs 60000 at the end of 25 years using diminishing value method the Depreciated value of equipment at the end of 20 years is **Rs 115615**
8. In the above question what is the depreciated value of the equipment at the end of 20 years on syncing fund method at 5% compound interest annually **Rs 520638**
9. If n is the useful life of equipment in years and r is annual rate of interest expressed as a decimal then syncing fund factor is $\frac{r}{(1+r)^n-1}$
10. In the diminishing value method for calculating depreciation the annual depreciation charge is independent of the **rate of interest**
11. The depreciation of equipment is **less in early years**
12. The annual deposit is **smaller** in syncing fund method as compare to straight line method
13. The most fundamental method for calculating the depreciation of equipment is **syncing fund method**
14. The straight line method for calculating depreciation is based on the assumption that depreciation charge is **constant every year**
15. If P is the capital cost of equipment n is useful life of the equipment in years S is the scrap value and x is annual unit depreciation then using diminishing value method **$S=P(1-x)^n$**
16. A distribution transformer costing Rs 50000 has a salvage value of Rs 5000. If annual depreciation charge is Rs 3000 on straight line method the useful life of the transformer is **15 years**
17. A generating plant has a maximum capacity of 100 kw and cost Rs 160000 the annual fixed charges are 12% if the load factor is 50% the fixed charges per kwh will be **4.38 paise**
18. An ideal value of P.F is **1**
19. A factory draws an apparent power of 300 kva at a lagging Pf of 0.65 the active power drawn by factor is **195kw**
20. In Q # 19 what is the reactive power drawn by the factory is **228kvar**
21. The lagging reactive power drawn by a load is 0 the PF of the load is **1**
22. Alternators and transformer are rated in **kva**
23. An alternator is rated at 1000 kva the maximum active power that can be drawn from it is **1000kw**

24. A load draws active power (P), apparent power (S) and reactive power (Q) from the line. The power factor of the load is **P/S**
25. The most economical PF for a consumer is generally **0.95 lagging**
26. The correct relation in the following is **Kvar =kw sin φ**
27. when the power factor is increased **line current decreases**
28. the following two tariffs are offered
- Rs 100 plus 15 pais per unit
 - a flat rate 30 per paise per unit
- Above 666.67 units** consumption is first tariff economical
29. A factory has a maximum load of 240 kw at PF 0.8 lagging with an annual consumption of 5000 units. The tariff is Rs50 per kva of maximum demand plus 10 paise per unit. The flat rate of energy consumption is **40 paise**
30. improving the PF means making it **close to unity**



Fig

31. Fig shows a single phase motor connected to 400v, 50Hz. the motor takes 31.7A at PF of 0.7 lagging. if a capacitor of capacitance C is connected in parallel with it the current drawn by the motor is **remains same**
32. in Q #31 the result of capacitor connection is that the active power drawn from the supply **remains same**
33. in Q #31 the result of capacitor connection is that the current drawn by motor **decreases**
34. when PF is improved the lagging Kvar drawn from supply will **decreases**
35. A load draws an active power P at lagging PF of $\cos \phi$. If the PF is improved to $\cos \phi_2$, the leading Kvar supplied by PF correction equipment will be **P (tan ϕ_1 -tan ϕ_2)**
36. A load draws power of 10kw at PF of 0.707 lagging. The lagging Kvar drawn from the supply will be **10Kvar**
37. if power factor is to be improved to 1 in Q#36 , the PF correction equipment should supply leading Kvar equal to **10Kvar**
38. An alternator supplying a load of 300 kw at PF of 0.6 lagging if the PF is raised to unity how many more Kw can alternator supply **200 kw**
39. A load takes a current of I at a PF of $\cos \phi$ the wattless component current is **I sin ϕ**
40. In order to improve PF in case of 3 phase loads the capacitors are connected in **Delta**
41. In a three phase system the line losses are **inversely proportional to $\cos^2 \phi$**
42. In a three phase system the line losses are W at PF of 1. If the PF become 0.8 lagging the losses will become **1.57Watt**
43. A factory draws an apparent power of 300 kva at a pf of 0.65 lagging what is the reactive power drawn at a PF of 0.85 lagging **121kvar**
44. A synchronous condenser improves PF by taking **leading Kvar**

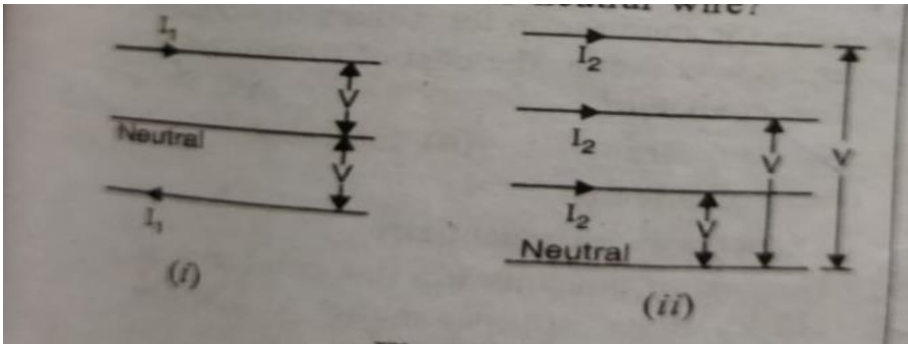
45. A 3 phase 5 kw induction motor has a PF of 0.75 lagging a bank of capacitors is connected in Delta across the supply terminals and PF raise to 0.9 lagging the kvar rating of capacitors connected in each phase is **0.663 kvar**
46. The total load taken from an Ac supply consist of
- A heating load of 15 kw
 - A motor load of 40 kva at PF 0.6 lagging
 - A load of 20 kw at PF 0.8 lagging
- The total active power drawn from the supply is **59 Kw**
47. In question 46 the total reactive power drawn from supply is **47 kvar**
48. In Q # 46 total apparent power drawn from the supply is **75.43kva**
49. In Q # 46 the overall PF is **0.782 lag**
50. In Q #46 a capacitor is connected in parallel with load and PF raise to unity the Kvar rating of capacitor should be **47 kvar**
51. A factory with has a maximum demand of 175 kw at PF of 0.75 lagging is charged at Rs 72 per kvar per Annum if the phase advancing equipment costs Rs 120 per kvar. The most economical power PF of the factory interest and depreciation total 10 % of the capital investment on the phase advancing equipment **0.986 lag**
52. The main reason for low PF of supply system is due to the use of **induction motors**
53. An over excited synchronous motor on no load is called **synchronous condenser**
54. when the PF is unity, the relation between line current I and supply voltage V is **I is in phase with V**
55. The best location of PF correction equipment to be installed on the transmission line is at the **receiving end**
56. for a given active power and voltage, the current drawn is maximum when the value of PF is **1**
57. arc and induction furnaces operates on **very low lagging PF**
58. A generating station has an installed capacity of 50000 Kw and delivers 220×10^4 units per annum. if the annual fixed charges are Rs 160 per Kw installed capacity and running charges are 4 paise per kwh , the cost per unit generated is **7.64 paise**
59. A bulk power consumer has a maximum demand of 2000kva at 0.8 pf lagging. The tariff is Rs 100 per Kva maximum demand plus 10 paise per Kwh of energy consumed. If the annual load factor is 50% the overall cost per unit is **12.85 paise**
60. An industrial concern has a maximum demand of 500 kva at 0.8 PF lagging and an annual load factor of 60%. if electrical power is supplied from a grid system at Rs 125 per Kva of maximum demand plus 5paise per unit, the cost per unit is **7.97 paise**
61. A supply is offered on the basis of fixed charges of Rs 30 per annum plus 3 paise per unit or alternative at the rate of 6 pais per unit for the first 400 units per annum and 5 paise per unit for all additional units. The number of units taken per annum for which the cost under the two tariffs become equal is **1300kwh**
62. The tariff in force is Rs 150 per Kva of maximum demand and 8 paise per unit consumed. if the load factor is 30%, the overall cost per unit at 0.7 PF lagging is **16.15 paise**
63. A customer has a maximum demand of 100 kw . The PF is 0.8 lagging and the load factor is 60 % . The tariff used is Rs 75 per Kva of maximum demand plus 15 paise per kWh consumed. the annual bill will be **Rs 88215**
64. when PF is improved, the KW capacity of alternator is **Increased**

65. the smaller the lagging reactive power drawn by circuit **the higher the PF**
66. A factory takes a steady load of 200 kW at a lagging PF of 0.8. The tariff is Rs 100 per Kva of maximum demand per annum plus 5 paise per kWh. The phase advancing plant cost 500 per kva and the annual interest and depreciation together amount to 10 %. the most economical Pf is **0.866 lagging**
67. in Q#66, What is the capacity of the phase advancing plant **34.52kvar**
68. Assuming the factory works for 5000 hrs. in a year in Q # 66 the new annual energy bill will be **Rs 74820**
69. When PF at the Generating station is improved the cost per unit **decreases**
70. The only motor that can be worked at leading PF is **Synchronous motor**
71. If C is the capacitance per phase for delta connected capacitor bank then capacitance per phase for star connected capacitor bank is **3C**
72. A workshop is consuming 500 kw at 0.707 PF lagging a synchronous motor is connected to improve the PF to 0.95 lagging the leading reactive power supplied by the synchronous motor is **336kvar**
73. If the synchronous motor in Q #72 takes 100 kw the PF of motor is **0.285 leading**
74. It is desired to correct to PF to 0.95 by means of static capacitor connected across each phase of a three phase 400 V 50Hz motor having a maximum load of 50 kva at PF of 0.75 lagging the capacitor are delta connected the leading kvar supplied by each capacitor is **6.915kvar**
75. In Q# 74 the capacitance of each capacitor is 137.6 microfarad
76. A synchronous motor having a power consumption of 50 kw is connected in parallel with a load of 200 kw having a PF 0.8 lag the excitation of the motor is adjusted until combined PF becomes 0.9 lag the leading kvar supplied by the synchronous motor is **28.92 kvar**
77. In Q# 76 the apparent power drawn by synchronous motor **57.76 kva**
78. In Q #76 the PF of the synchronous motor is **0.866 lead**
79. For a large installation it's better to apply **individual correction to large motors**
80. Most of the loads are **inductive**

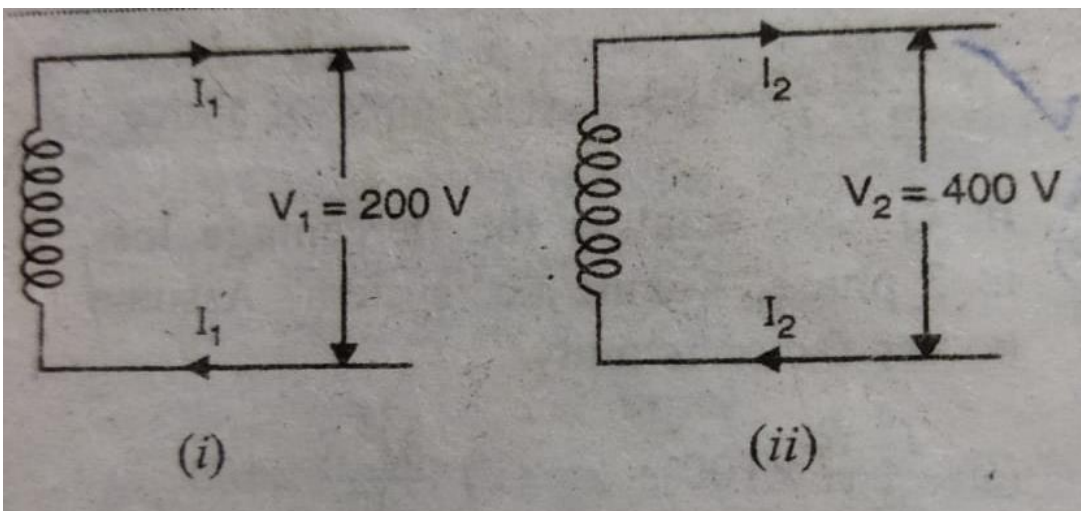
CHAPTER 26

SUPPLY SYSTEM

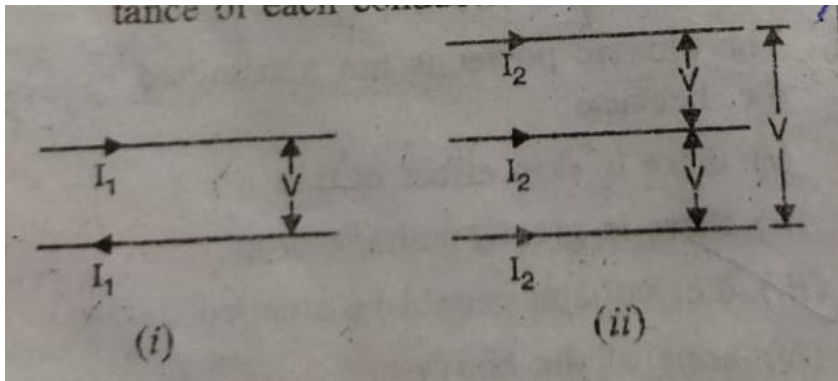
1. The transmission of electric power is done by **3-phase ,3 wire system**.
2. As a matter of economy,voltages for power transmission should be **high**.
3. The primary distribution of electric power is done by **3 phase,3 wire system**
4. When transmission system is increased,line losses are **decreased**.
5. If voltage is increased by n times,size of conductor would reduce by **$1/n^2$ times**.
6. The annual charge of a transmission line can be expressed as **$P_1 + P_2 a$**
7. In a supply system,cost of conductor is **directly proportional to area of cross-section**
8. The term service main refers to **secondary distribution**
9. The economic size of a conductor is determined by **kelvin's law**
10. The relation between annual cost of energy wasted in an overhead transmission line and area of cross section of conductor is **C inversely proportional to area of cross section**
11. Secondary distribution is carried out at **400/230 volt**
12. In a 3 wire balanced DC system,voltage between outer and neutral conductor is V.voltage between outers is **2V**
13. As a rough guide ,most economical transmission voltage is **1.6 kV/km**
14. In a 3 phase,4 wire ac system,number of voltages we get is **two**.
15. What is the percentage saving in the conductor material used for a transmission line ,for the same power transmitted power factor and power loss,in the line transmission voltage is increased from 66 KV to 132 KV? **75%**
16. If length of transmission is increased from 300 to 400km,suitable voltage will be **400 KV**.
17. A 2-conductor cable 1 km long is required to supply a constant current of 299A throughout the year.cost of cable including installation is Rs. $20a+20$ per meter where a is the area of cross section of conductor in cm^2 . cost of energy is 5P per kwh and interest and depreciation amount to 10%.resistivity of conductor material is 1.73 micro ohm cm.what is resistance of conductor?
 $R= 0.173 /a$
18. Energy lost per annum in above question is **1,21,238.4 /a kwh**
19. Annual cost of energy lost is **RS.6062/a**
20. Total capital cost is **Rs.20,000 a**
21. Variable charge is **Rs.2000 a**
22. Most economical conductor size is **1.74 cm^2**
23. A DC 3 wire system is to converted into 3 phase 4 wire system by adding fourth wire equal in X-section to each outer of dc system.The percentage power loss and voltage at the consumers terminals are to be the same.assume loads to be balanced.what is power loss in neutral wire?**zero power loss as load is balanced**.



24. What is percentage power loss in 3 wire dc system? here R is resistance of each conductor and V is conductor to neutral voltage = $2 I_1^2 R / 2 V I_1$
25. What is percentage loss in 3 phase 4 wire AC system? $3 I^2 R / 3 V I$
26. The extra power that can be supplied by AC system at unity power factor is **50%**
27. Power P is to be transmitted by overhead lines over length l. for the same power loss and same voltage between conductor and earth ,least conductor material required is in **2 wire DC system**
28. Electric power is not transmitted by DC because **dc voltage cannot be stepped up**
29. By extra high voltage we mean voltage **above 220KV**
30. LINE voltage of a 2 wire dc system is raised from 200 v to 400 v for same power transmitted over same distance having same power loss.what is current supplied by 400 V system? $I_2 = 0.5 I_1$



31. In above question, what is percentage saving in feeder copper when voltage is raised from 200 V to 400 V? **75 %**
32. A dc 2 wire system is to be converted into ac 3 phase 3 wire system by addition of a third conductor of same cross section as the two existing conductors. if voltage between wires and percentage loss in line remain unchanged, what is percentage power loss in two wire dc system? assume voltage between lines is V and resistance of each conductor is R
 $2 I_1^2 R / 2 V I_1 * 100$.



33. What is percentage power loss in 3 phase 3 wire ac system? Assume a balance load of unity power factor . $3 I_2^2 R / (\text{SQUARE ROOT of } 3) \times V \times I_2$
34. Additional power that can be supplied by 3 phase ,3 wire AC system is **100%**
35. Cost of transmission line conductor at 132 KV is Rs.100 per meter. When transmission voltage is increased to 220 KV, cost of conductor is **Rs.36/m**
36. As compared to 2 wire DC system, volume of conductor material required in 3 phase 3 wire ac system is **$0.5 / \cos^2 \Phi$**
37. 220 kv transmission line voltage is economical for a distance of **200 km**.
38. With the increase in voltage and power factor ,cost of transmission line **decreases**.
39. The cost of transmission line conductor at 110kv is Rs.100 per meter.at 200 KV, cost per meter will be **Rs.25**
40. In a transmission line,major cost is due to **conductors**.
41. By increasing the transmission voltage to double of its original value,the same power can be delivered keeping the line loss **one fourth of its original value**.
42. In a transmission system,weight of copper used is proportional to **$1/V^2$**
43. With the same maximum voltage between conductors,ratio of volume needed in 3 phase ,3 wire system and single phase 2 wire system is **$3/4$**
44. The permissible variation of frequency in power system is **+3 %**
45. A 50 km long transmission line supplies a load of 5 MVA at 0.8 power factor lagging at 33 KV.The efficiency of transmission is 90 %.the volume of Al conductor (specific resistance of aluminium = 2.85×10^{-8} ohm meter) required for single phase 2 wire line is **$16.35m^3$** .
46. In above question ,for the same line loss,volum eof aluminium conductor required for 3 phase,3 wire system is **$12.27m^3$** .
47. A single phase a.c system supplies a certain power and this system is converted to 3 phase a.c system by running a third similar conductor.the percentage addotional load that can be supplied for the same voltage between conductors and same percentage loss is **100%**.
48. A given amount of power is to be transmitted by an overhead line. For the same power loss in the line,how many times will the diameter of aluminium conductor be more than copper conductor. The resistivities of Al and Cu are 2.85×10^{-8} ohm meter and 1.7×10^{-8} ohm meter respectively. **1.293**
49. In above question, if specific gravity of Al is 2.71 and that of copper is 8.89 ,how many times will the weight of Al conductor be more than that of Cu conductor **0.51**
50. The feeder is mainly designed from the point of view of its **current carrying capacity**.
51. The transmission of electric power is carried out at high voltages because **it reduces volume of conductor material and percentage line drop**.

52. The disadvantage of power transmission at high voltage is increased cost **of insulating the conductors, transformers and switchgear.**
53. In a dc 2 wire feeder, voltage drop per wire is 2.5%. transmission efficiency of feeder is **95%.**
54. The high voltage d.c transmission is better than a.c transmission because of **absence of inductance and capacitance, absence of skin effect and better voltage regulation.**
55. Skin effect exists in **a.c transmission line.**
56. Increasing the frequency of transmission line will **increase line resistance.**
57. A given amount of power is to be transmitted over a certain distance with fixed power loss. volume of copper required is **proportional to $(1/V^2 \cos^2 \theta)$**
58. The dielectric strength of air under normal conditions is **30 KV/cm**
59. Which of following voltage regulation is considered to be the best? **2%**
60. A d.c line compared to equivalent a.c line carries **more power.**

Chapter # 27 V.K Mehta Over headlines

1. **Porcelain** is the most commonly used material for insulator of overhead lines.
2. For DC system the string efficiency is **100%**.
3. Suspension type insulators are used voltages beyond **33kv**.
4. The potential across the various discs of suspension string is different due to **shunt capacitance**
5. In overhead transmission line, the sag depends **on tension in the conductor, conductor material and height of tower.**
6. In a string of suspension insulators, Line voltage = $\sqrt{3}$ x voltage across string
7. In a 33-kV overhead line, there are 3 units in the string of insulators. The voltage across the string is **$33/\sqrt{3}$** .
8. In Q. 7, the voltages across the various discs are 5.52 kV, 6.13 kV and 74 kV. The volt-age across the middle unit is **6.13 kV**.
9. In Q. 8, the string efficiency is **85.8%**.
10. In Q. 8, the voltage across the top unit is **5.52 kV**
11. Sag is provided in overhead lines so that **safe tension is not exceeded.**
12. If the span is increased, the sag **increases.**
13. **Lengthy numerical**
14. **Lengthy numerical**
15. An overhead line conductor has a cross-sectional area of 3.2 cm². It is supported on level supports of a span of 150 m. The specific weight of the conductor is 7800 kg/ m³, and the working stress is 1050 kg/cur. The working tension is **3360 kg**

$$T = \text{Working stress} \times \text{Area of conductor}$$

$$= 1050 \times 3.2 = 3360 \text{ kg}$$
16. In Q. 15, the sag is **2.1m**

$$S = \frac{wl^2}{8T} = \frac{2.5 \times (150)^2}{8 \times 3360} = 2.1 \text{ m}$$
17. In Q. 15, the conductor is acted upon by a wind pressure of 40 kg/m² and a 5mm thick layer of ice is formed on the conductor. The weight of ice per meter conductor length is **0.358 kg/m**

$$17. \text{ Conductor diameter, } D_1 = \sqrt{\frac{4}{\pi} \times 3.2} = 2 \text{ cm} = 0.02 \text{ m}$$

$$\text{Diameter with ice, } D_2 = 20 + 2 \times 5 = 30 \text{ mm} = 0.03 \text{ m}$$
18. In Q. 17, the resultant weight is **3.1kg/m.**
19. In Q. 17, the slant sag is **2.6 m.**
20. In Q. 17, what is the vertical sag **2.4m.**
21. **Lengthy numerical**
22. **Lengthy numerical**

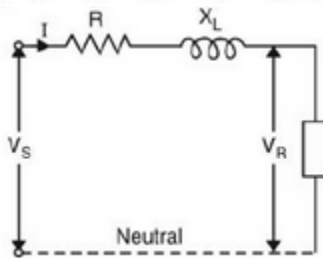
23. If D is the diameter of the conductor and t is radial thickness of ice on it, then volume of ice per meter length of conductor is $\pi t(D+t)$
24. The wind pressure is directly proportional to **square of speed of wind**
25. If safety factor is doubled, the sag of the line will **increase**.
26. On an overhead line, the wind load acts **horizontally**.
27. In a string of suspension insulators, if shunt capacitance decreases, then string efficiency **increases**.
28. The conductor vibration of an overhead line may cause **(i) breaking of insulator discs excessive sag (iii) collapse of supporting structures**.
29. If the string efficiency is increased, the voltage across the disc nearest to the conductor **decreases**.
30. A string of suspension insulators has three discs. If the disc nearest to the conductor flashes over (i.e. breaks down), then **the remaining discs will flash over**.
31. In a string of suspension insulators, the discs are connected in **series**
32. In a string of suspension insulators, the charging current is maximum through the disc **nearest to the conductor**.
33. If shunt capacitance in a string of suspension insulators is decreased, then string efficiency **increases**.
34. In a string of suspension insulators, the shunt capacitance can be decreased by using **longer cross-arms**.
35. In order to improve string efficiency by the method of capacitance grading. the maximum capacitance is of the disc is **nearest to the conductor**.
36. In a 33-kV overhead line, there are 3 units in the string of insulators. The voltage across the string is **19.05 kV**.
37. In Q. 36, if the string efficiency is 85.8 %, then voltage across the disc nearest to the conductor is **7.4 kV**.
38. In Q. 36, if the string efficiency is 100%, then voltage across the disc nearest to the conductor is **19.05/3 kV**.
39. 100% string efficiency means **shunt capacitance is zero**.
40. In a string of suspension insulators, voltage **across disc nearest to cross-arm is minimum**.
- Pages are missing for MCQs 41-53**
54. If the spacing between conductors increases, the corona effect **decreases**.
55. The minimum phase-neutral voltage at which corona occurs is **called critical disruptive voltage**.
56. A stranded conductor has **more corona effect than a solid conductor**.
57. When the length of transmission line increases, the resistance (R) of the line **increases**.
58. When the length of transmission line increases its inductive reactance (X_L) **increases**.
59. As the length of transmission line increases, its capacitive reactance (X_C) **decreases**.
60. The capacitance of a transmission line be neglected in case of **short line**.

61. The capacitance between the conductors of a single phase, 2-wire line is C. The capacitance between one conductor and a neutral point between them is **2C**
62. In a.c. system, the skin effect **(i) reduces effective area of conductor (ii) increases resistance of conductor (iii) causes greater power loss**
63. The diameter of a round conductor is 1 cm. Its geometrical mean radius (G.M.R.) is **0.7788 cm.**
64. The skin effect depends upon **(i) nature of material (ii) diameter of wire (iii) frequency**
65. A 3-phase transmission line uses 1.24 cm diameter conductors and these arcs placed at the corners of an equilateral triangle of side 2 m the inductance per phase meter is **12×10^{-7}**
66. In Q. 65, inductance/phase/km is **1.2mH.**
67. The three conductors of a 3-phase line are arranged at the corners of a triangle of sides 2 m, 2.5 m and 4.5 m. The conductors are regularly transposed and the diameter of each conductor is 1.24 cm. What is the equivalent equilateral spacing? **282cm**

MCQs from 68 to 98 are missing in the book

99. Expression for V_s is

$$(ii) \quad V_s = V_R - IR \cos \phi_R - IX_L \sin \phi_R$$



100. In Q 99. V_R will be equal to V_s if $\cos \theta$
 (i) is leading and $IR \cos \phi_R = IX_L \sin \phi_R$
101. If the value of $\cos \theta$ in Q99 is such leading that $IR \cos \theta_R > IX_L \sin \theta_R$ then **$V_R < V_s$**
102. In Q. 99. the generalised constant H of transmission line is **B=Z**
103. The nominal T circuit of a transmission line has $R= 10 \Omega$, $X= 20 \Omega$ and $Y=400 \mu S$ for each phase. The generalized constant, A of the line is **$0.996 < 0.115$**
104. In Q. 103. the generalized constant H of the line is **$22.25 < 63.45^\circ$**
105. In Q. 103, the generalized constant C of the line is **$4 \times 10^{-4} < 90^\circ$**
106. Which of the two generalized constants of a transmission line are equal **A and D**
107. The line constants of a transmission line are **uniformly distributed**
108. In nominal π circuit the generalized constant of A of the line is

$$\left(1 + \frac{\vec{Y} \vec{Z}}{2} \right)$$

109. In Q.108 the constant of B is **equal to Z**
110. In nominal π circuit the generalized constant of C of the line is

$$\bar{Y} \left(1 + \frac{\bar{Y} \bar{Z}}{4} \right)$$

111. In Q 108 AD-BC is equal to **1**
112. The voltage regulation of a short transmission line will be zero when the value of $\tan\theta_R$ for leading power factor will be **R/X_L**
113. The voltage regulation of a short transmission line will be maximum when the value of $\tan\theta_R$ for lagging power factor is unity **X_L/R**
114. The receiving and power factor of a short transmission line is changing from lagging to leading the voltage regulation of the line will **decrease**
115. The voltage regulation of a transmission line is greatest for **lagging p.f**
116. The line resistance (R) and inductive reactance in a transmission line are related to **$X_L > R$**
117. Negative voltage regulation of transmission line means **$V_R > V_S$**
118. For unity p.f., the voltage regulation of a short transmission is **IR**
119. For zero power factor lagging, the voltage regulation of a short transmission line is **IX_L**
120. A short single-phase transmission line has a loop impedance of $(0.2 + j1.2)$. At **0.986** leading power factor, the voltage regulation will be zero

Chapter # 28

Distribution of Electric Power

Composed by ANSA NAWAZ.

- 11- In a 3-phase 4 wire a.c system, unbalancing is caused due to the connection of single-phase loads.
- 12- The bulk power consumers are supplied at 11 kV.
- 13- In primary distribution lines, the earth wire is placed below the phase conductors.
- 14- As compared to underground system the overhead system is more flexible.
- 15- In a balanced 3-phase 4 wire system, the phase sequence is RYB. If the voltage of R phase sequence is 230 V. Then for B phase it will be 230 V.
- 16- As compared to overhead system, the underground system is more costly, has less chances of faults and has more useful life.
- 17- If the insulation resistance of a cable of length 10 km is 1 Mohm its insulation resistance for 50 km length will be 0.2 Mohm.
- 18- When the length of a cable increases its capacitance increases.
- 19- Grading of cables is carried out to achieve economy, reduce overall cable diameter and have uniform stress distribution.
- 20- The cable fault may be due to break in conductor, failure of insulation between conductor and failure of insulation between conductor and earth.
- 21- The minimum dielectric stress in a cable is at lead sheath.
- 22- In a 3-wire d.c system the area of cross section of neutral wire is generally half that of outers.
- 23- A line from which loads are tapped off is called distributor.
- 24- 3 phase 4 wire a.c system distribution system is used for combined power and lighting loads.
- 25- Insulating material for cables should have high insulation resistance, high dielectric strength and high mechanical strength.
- 26- The statutory limit for voltage variation at the consumer's terminal is +6% of declared voltage.
- 27- The electrical appliances give poor performance if the voltage variation is more than +6%.
- 28- The distribution transformer is rated in kVA.
- 29- In a.c motors the magnetizing current lags the voltage by 90 degree.
- 30- The low lagging power factor in a.c power system is due to induction motors, arc lamps and varying load on the system.

- 31-The low lagging power factors results in large copper losses, poor voltage regulation and reduced handling capacity.
- 32- The most common fault in overhead distribution system is one phase to earth fault.
- 33- The ring main system is used in power distribution because it is reliable for continuity of supply, gives better voltage regulation and results in less feeder losses.
- 34- The current in the radial distributor will be maximum at the source end of the distributor.
- 35- The interconnected distribution system is more reliable because of the use of two or more sources of supply.
- 36- The voltage in a radial distributor will be minimum at the end of the distributor.
- 37- In an ac system, additions and subtractions of currents are done vectorially.
- 38- Voltage of primary distribution system is 11kV.
- 39- 1 Phase 2 wire system is used for domestic loads.
- 40- 3 phase 3 wire system is used for balanced loads.
- 41- Power distribution by cables is generally adopted for line length less than 10 km.
- 42- Sheaths are used in cables to prevent ingress of moisture.
- 43- The domestic load that has unity power factor is filament lamp.
- 44- A certain cable has an insulation of relative permittivity 2.If the insulation is replaced by one of relative permittivity 4, then capacitance of cable becomes 2 times.
- 45-66 missing.
- 67-1 phase 2 wire system is used for domestic loads.
- 68-As compared to overhead system the maintenance cost of underground system is very low.
- 69-In a balanced 3 wire dc system the voltage across the outers is 500V. The voltage between any outer and neutral wire is 250V.
- 70- In ac system, voltage drop is due to either resistance alone, inductance alone or capacitance alone.
- 71- A single core cable has a conductor diameter of 1 cm and insulation thickness of 0.4 cm. If the specific resistance of insulation is 5×10^{14} ohm-cm, the insulation resistance of 2km cable will be 234 Mohm.
- 72- In above question 71 , the insulation resistance of 1 km cable will be 468 Mohm.
- 73- The maximum and minimum stresses in the dielectric of single core cable are 40kV/cm (rms) and 10 kV/cm (rms) respectively. If the conductor diameter is 2 cm the insulation thickness is 3 cm.
- 74- In above Qs 73 the operating voltage is 55.45 kV (rms).
- 75- The radial system of power distribution is used for short distances only.

76- In a 3-wire dc system the load on the positive side is 400A and -ve side it is 300A. Then current in neutral wire is 100A.

77- A booster is connected in series with the feeder.

78- A booster is a dc series generator.

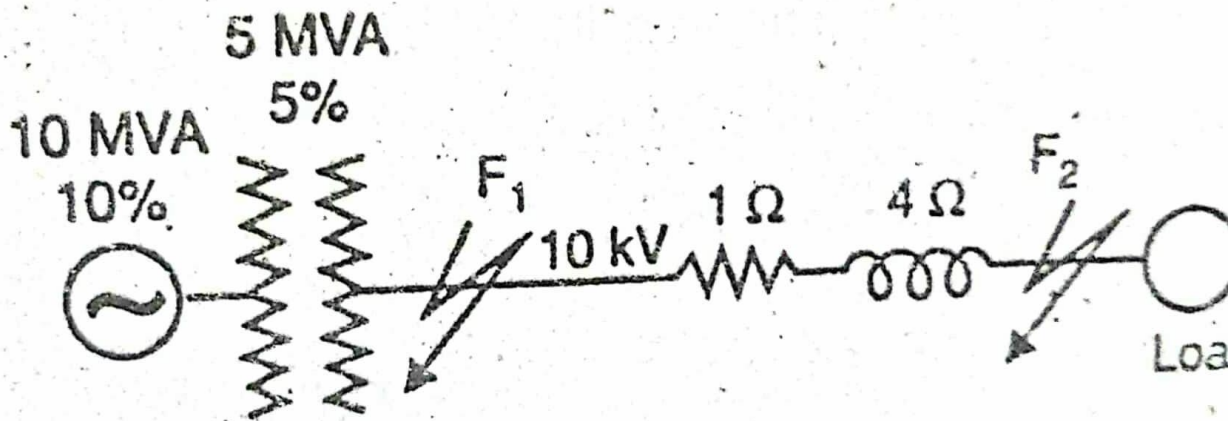
79- In a 3 phase balanced load each phase has same impedance and pf.

80- Voids in the layers of impregnated paper insulation decreases the breakdown voltage of cable.

Chapter 29 Faults In Power System

1. When all the three phases are short circuited, the current through the system is **Very Large**.
2. The most common fault on an overhead transmission line is **Single line to ground fault**.
3. The fault on a power system that gives symmetrical fault currents is **Three phase short circuit fault**.
4. A 1000 KVA transformer has a reactance of 5%. Its reactance at 2000 KVA base is **10%**.
5. The percentage reactance of the system on base KVA upto fault point is X%. Then short circuit KVA base is **10%**.
6. A symmetrical fault occurs on a power system. The percentage reactance of the system on 2500 base KVA is 25%. If the full load current corresponding to base KVA is 20A, the short circuit current is **80A**.
7. In Q6, If the base KVA is 5000, the short circuit current is **80A**.
8. The most severe fault on a power system is **Three phase short circuit**.
9. The ratings of circuit breakers are generally decided on the basis of **symmetrical fault currents**.
10. Reactors are used at various locations in the power system to **limit short circuit current**.
11. The use of reactors permits the installations of circuit breakers of **lower ratings**.
12. When short circuit occurs in a power system: **voltage at fault point is zero, A very large current flows in a power system and equipment gets overheated**.
13. If the percentage reactance of the system upto fault point is 20% and base KVA is 10,000, then short circuit KVA is **50,000KVA**.
14. Reactors are connected **in series** in the system.
15. In a balanced three phase system, **both negative and zero sequence currents are zero**.
16. In short circuit calculations, the selected base KVA is equal to: **that of the largest plant, the total plant capacity and any arbitrary value**.
17. A three phase transmission line opening at 10KV has a resistance of 1 ohm. The percentage resistance of the line at 10,000 KVA base is **10%**.
18. The positive and negative sequence impedance of a transmission line are **equal**.
19. The zero sequence impedance of different elements of power system is generally **different**.

20. On the occurrence of an unsymmetrical fault, the sequence component which is always greater than the negative sequence component is **Positive sequence component**.
21. The operator a rotates the vector in anticlockwise direction by **120°**.
22. The correct relation is **$1+a+a^2=0$** .
23. The correct relation is **$a^2 = -0.5-j0.866$**
24. The positive sequence component of voltage at the point of fault is zero when it is **3-phase short circuit fault**.
25. The positive, negative and zero sequence impedance of a solidly grounded system under steady state condition always follow the relation : **$Z_1 > Z_2 > Z_0$**
26. In a 3-phase, 4-wire unbalanced system, the current in the neutral wire is 12A. The zero sequence current in each phase is **4A**
27. $\frac{1-a^2}{a-a^2} = -a$
28. $\frac{1-a}{1+a^2} = 1-a^2$
29. In a synchronous generator, the positive sequence impedance (Z_1) and negative sequence impedance (Z_2) are related as : **$Z_1 > Z_2$**
30. In a transformer, Z_1 and Z_2 are related as: **$Z_1 = Z_2$**
31. The vector sum of positive sequence currents is: **zero**
32. Cables and line are mostly **resistive**.
33. A short circuit may lead to : **excessive current, fire and low voltage in system**.
34. The impedances of transformer and alternator are mostly **inductive**.
35. figure below shows the single line diagram of a three phase transmission line. The three phase short circuit fault (symmetrical fault) will be:



More severe at F1.

36. In question 35, the percentage reactance of alternator and transformer on 10,000 base KVA are **10%, 10%**
37. In Q 35, the percentage reactance of the transmission line on 10,000 base KVA is **40%**
38. In Q 35, if 3-phase fault occurs, the short circuit KVA fed to the fault will be **more if fault occurs at F1**
39. In Q 35, if an unsymmetrical fault occurs at F1, it will be **less severe than symmetrical fault at F1**
40. Unsymmetrical faults : **Introduce unbalancing in the system, Indicate abnormal conditions in the system, Are more frequent than symmetrical faults.**
41. The short circuit KVA is maximum when fault occurs **near the generator.**
42. Current limiting reactors in a power system have **large reactance and low resistance.**
43. Oil immersed air cored reactors are used as current limiting reactors because **They have higher safety against flash over, They have high thermal capacity, Oil serves the purpose of cooling and insulation.**
44. The method of symmetrical components is very useful for **solving unbalanced 3-phase circuits, analysing the performance of 3-phase electrical machinery, Calculating currents resulting from an un-balanced fault.**

45. In a 3-phase,4-wire, unbalanced system, the current in the neutral wire is 18A. The magnitude of zero sequence current is **6A**
46. The most severe unsymmetrical fault is **double line to ground fault.**
47. The positive sequence impedance of a feeder is 3Ω . Its negative sequence impedance will be **3Ω**

48. The currents in a three phase unbalanced system are:

$$I_r=(12+j6)\text{A},$$

$$I_y=(12-j12)\text{A},$$

$$I_b=(-15+j10)\text{A}$$

The phase sequence is RYB. The zero phase sequence component in R-phase is **$(3+j1.33)\text{A}$**

49. In Q48, the positive phase sequence component of current in R-phase is **$(10.85+j10.13)\text{A}$**

50. In Q48, the negative phase sequence component of current in R-phase is **$(-1.85-j5.47)\text{A}$**

51. In Q48, the zero phase sequence component of current in Y-phase is **$(3+j1.33)\text{A}$**

52. A 3-phase, 4-wire system supplies loads which are unequally distributed in the three phases. An analysis of the current flowing in R,Y an B lines shows that in R-line, positive sequence component is $200\angle 0^\circ\text{A}$ and the negative phase sequence component is $100\angle 60^\circ\text{A}$. The total observed current flowing back to the supply in the neutral conductor is $300\angle 300^\circ\text{A}$. The zero phase sequence current in R line is **$100\angle 300^\circ$** .

53. In Q52, zero phase sequence current in Y line is **$100\angle 300^\circ$**

54. In Q52, current in R line is **$300\angle 0^\circ$**

55. In Q52, current in Y Line is **$300\angle -120^\circ$**

56. A delta-connected load is supplied from a 3-phase supply. The fuse in the B line is removed and the current in other two lines is 20A. The various line currents are (R-phase is reference)

$$I_r= 20\angle 0^\circ \text{ A}$$

$$I_y=20\angle 180^\circ \text{ A}$$

$$I_b= 0 \text{ A}$$

57. In Q56, the zero sequence component of I_r is **0 A**

58. In Q56, the zero sequence component of I_y is **0 A**

59. In Q56, the positive sequence component of I_r is **$11.54\angle -30^\circ$**

60. In Q56, the negative sequence component of I_r is $11.54\angle 30^\circ$

CHAPTER 30 VK MEHTA (SWITCH GEARS).

1. A fuse is **Protective device**
2. A circuit breaker is a **Circuit Interrupting device**
3. Isolator is designed to operate under: **No load.**
4. Under normal condition CB (circuit breaker) **remain close**
5. A fuse performs both **detection and interruption**
6. CB performs : **circuit interruption only**
7. Fault come in power system: **CB opens automatically**
8. CB is able to open under: **No load condition, load condition, fault condition.**
9. Device detects fault in Power System: **relay**
10. Arc is produced when high V and large I circuit is **Open**
11. For same power least size is: **SF₆ CB**
12. Under fault condition great noise will be in case: **Air blast CB**
13. If length of arc increases its resistance: **Increases**
14. Current Chopping mainly occurs in: **Air blast CB**
15. Speed of Circuit interruption in forced blast CB: **fast**
16. In a Bulk oil CB, the oil used for arc extinction: **10 % of total.**
17. CB of 1500A, 1000MVA, 33Kv, 3 seconds, 3 phase oil CB rated Current: **1500A**
18. Breaking capacity of CB: **1000MVA**
19. Rated symmetrical breaking: **17496 Amp(rms)**
20. Making Capacity: **44614 Amp**
21. Short Time: **17496 for 3 Sec**
22. Rated service V: **33kV**
23. Low oil CB oil perform: **Arc extinction only**
24. CB perform duty: open fault circuit, close on fault, caring fault I for short time, **All**
25. Low oil CB Advantage over bulk oil CB: **ALL**
26. Capacitive circuit breaking: **Volt surges**
27. Normal practice to making current of CB is in: **Peak value**
28. Correct statement: **Sf6 gas costly, has high dielectric strength, is toxic. All above**
29. When oil CB operate under fault 1 cm³ of oil forms about: **100cm³ of gas**
30. Breaking capacity of SF₆ CB is not affect by: **Weather and moisture, pollution, atm pressure.**
31. Relay operating coil is supplied through: **CT**
32. Most of relay on service: **Electromechanical relay**
33. An overcurrent relay setting of 125% through a CT of 400/5 A the pickup Current: **6.25A**
34. The pickup Current of relay is 7.5A, fault current 30A, plug setting multiplier PSM: **4**
35. The rated secondary current of CT for relay is generally: **5A**
36. A 1VA, 2 VA relay is more sensitive: **1VA relay**
37. A fault current is 2000A the relay setting 50% CT ratio is of 400/5 A the PSM: **None of above**
38. Induction relays used for: **AC quantities**
39. The current in power lines is 100A A short circuit fault occurs on line, the short circuit current can be **more than 1000A**
40. The normal current is 100A in line suddenly become 150A : **Overload condition**
41. Back up protection: **short circuit fault only**
42. Fault occur in Power system primary protection operate: **About 90% cases.**

43. Back up protection: is second line of defence, operates when primary protection fails, operation disconnects a large part of system. all of above
44. Rate of rise of restriking V: depend on Inductance and Capacitance of system.
45. Interruption of HV and low current the CB: Vacuum type
46. Round wire of diameter d fusing current I is given: I directly proportion to $d^{3/2}$
47. A fuse wire of 08mm blows off at 8A. The radius of wire which will blow 1A will be: 02mm
48. The current rating of fuse: is 5A the fusing rating: more than 5A
49. Fusing factor: Always more than 1
50. The operating time of fuse: 0.002 sec
51. The operating time of a circuit breaker is 0.2 seconds.
52. The advantage of High Rupturing Capacity HRC cartridge fuse is that it doesn't deteriorate with age, has high speed operation and is quite cheap.
53. Fuses are used in circuits where frequent operations are not expected.
54. A fuse element is generally made of silver.
55. As compared to a circuit breaker, the breaking capacity of fuse is less.
56. The time current graph of a fuse has inverse characteristics.
57. A fuse should have low melting point, high conductivity and low cost.
58. The present trend is to use silver as fuse element because it is free from oxidation, doesn't deteriorate when used in dry air and has high conductivity.
59. For a semi enclosed fuse employing copper as the fusing element, the fusing factor is about 2.
60. As compared to a circuit breaker, a fuse is cheaper.
61. During which part of fault current wave fuse melts: when first peak is reached.
62. Two fuse wires of same material having fusing currents of 10 A and 5 A. The 10 A fuse will have larger diameter.
63. In order to reduce voltage surges due to chopping and capacitive current breaking, we connect a resistor across contacts of CB.
64. A 50 Hz, 11kV, 3 phase alternator with earthed neutral has 5 ohm reactance per phase and is connected to a bus bar through a CB. The distributed capacitance upto CB between phase and neutral is 0.01 micro farad. The peak re-striking voltage across contacts of CB: 17.96kV
65. Frequency of oscillation in Question 64: 12628 Hz.
66. Average rate of rise of re-striking voltage upto first peak: 453×10^3 kV/sec.
67. In short circuit test of a CB, following readings were obtained on single frequency transient: Time to reach peak re-striking voltage is 59 micro second. Peak re-striking voltage is 100 kV. The average rate of rise of re-striking Voltage is 2×10^6 kV/sec.
68. Frequency of oscillation in Question 67: 10,000Hz.
69. Fault that imposes severest duty on CB is : all three line short circuited.
70. Sf6 Breaker is preferred for EHV applications
71. Making Capacity of a CB is $2.55 \times$ Symmetrical Breaking Capacitor.
72. In 132 kV system, phase to ground capacitance is 0.01 micro farad and inductance is 6 H. Voltage that appears across CB contacts is a magnetizing current of 10 A is interrupted is 245 kV.
73. Air Break CB used in railway applications.
74. In Question 72 , Resistance used across contacts of CB to eliminate voltage surge is 12.24 k ohm.

75. Most efficient torque producing actuating structure for Induction type relay is **Induction Cup Structure**.
76. When using Air CB, current Chopping is phenomenon often observed when **a transformer on no load is switched off**
77. If Inductance and Capacitance of a system are 1 H and 0.01 micro farad and the instantaneous value of interrupted current is 10 A, voltage across CB contacts **is 100 kV**.
78. Three phase CB is rated at 2000 MVA, 33kV, the symmetrical breaking current is **35 kA**.
79. In Question 78, making current is **89 kA**.
80. Resistance switching is normally restored in case of **Air blast CB**.
81. The operation of fuse is based upon **heating effect of electric current**.
82. A fuse in motor circuit provides protection against **short circuit**.
83. A fuse is always connected in **series with the circuit**.
84. Fuses normally protect a system against **over current**.
85. HRC fuses provide best protection against **short circuit**.
86. In HRC fuses, the time between cut off and final current zero is called **arcing time**.
87. Rating of fuse expressed in terms **of Amperes**.
88. Insulation of electric arc at the instant of contact separation in CB is caused by **thermionic emission of electrons and field emission of electrons**.
89. Constant Resistance of a CB is **20 micro ohm**.
90. Sparking occurs on switching off the load due to high circuit **Inductance**.
91. The arc voltage in a CB **is in phase with arc current**.
92. The transient voltage that appears across the contacts of the CB at the instant of arc extinction is known as **re-striking Voltage**.
93. The recovery voltage in a CB is maximum for a power factor of **Zero**.
94. The making current of a CB is normally specified in terms of **peak value**
95. The trip coil of a CB is connected through a CT of ratio 50:1. If normal line current is 160A and circuit breaker is to operate at 125% of normal line current, the trip mechanism should be set to operate at a trip current **of 4A**.
96. **SF6 CB** have high reliability and negligible maintenance.
97. The rating of a circuit breaker is usually determined on basis of **Symmetrical fault**.
98. An overcurrent relay having a current setting of 125% is connected to a supply circuit through a CT of ratio 400/5. The pick up current **is 6.25A**.
99. If the fault current is 2000A, the relay setting 50% and CT ratio 400/5, the plug setting multiplier will be **10**.
100. Arc Interruption takes place in Oil CB when **current goes through zero**

Chapter 31

1. The most dangerous fault in an alternator is **stator winding faults**
2. When failure of prime-mover takes place, the alternator
 - 1.runs as synchronous motor
 - 2.draws some current from the supply
 - 3.is in the inverted running mode**4.all of the above**
3. The most important stator winding fault in an alternator is **fault between phase and ground**
4. The earth fault current is generally **less** Than the short-circuit current
5. Overheating of a transformer may be due to
 - 1.overloads
 - 2.short-circuits
 3. Failure of cooling system**4.all of the above**
6. In an alternator, relay protection is absolutely necessary against **stator winding faults**
7. Buchholz relay in oil immersed transformer provides protection against
Insulation failure of windings ,
core heating ,
fall of oil level
4.all of the above
8. Buchholz relay is **a gas accuated relay**
9. In case of slow developing faults in a transformer, the buchholz relay **sounds an alarm**
10. If the stator winding fault is not cleared quickly , it may lead to
burning of stator coils
burning and welding-up of stator laminations
damage to other equipment
4.all of the above
11. For the proper protection of power system , the operating time of a relay should be **less than 1 second**
12. The busbar protection means protection of
busbar
isolating switches
circuit breaker
4.all of the above
13. The least expensive protection for low voltage system is **fuse**
14. To protect the power transformer with star-delta connection against earth and phase faults, the current transformer should have **delta – star connection**
15. The number of pilot wires required for the protection of 3-phase transmission lines using translay system of protection is **2**

16. As compared to station equipment (e.g. alternators, transformers etc), the chances of faults on overhead lines are **more**
17. The ideal scheme of protection for overhead lines is **distance protection**
18. The most serious voltages on the power system are those caused by **lightening**
19. The equipment used for the protection of power system against lightening surges is
 earthing screen
 overhead ground wire
 lightning arrester
4. All of the above
20. Earthing screen provides protection to power stations and sub-stations against **direct lightning stroke**
21. The ground wires are placed **above** the line conductors.
- 22.** The ground wires protect the transmission lines against **direct lightning stroke**
23. The surge diverters protect the station equipment against
 direct lightning stroke
 travelling waves
3.both 1 and 2
24. Under normal operation , a lightening arrester conducts **no** current to earth.
25. The translay scheme of protection of overhead lines is essentially a **voltage** Balanced system.
26. Merz-price circulating current principle is **more suitable for generation**
27. The relay protection is not provided for overload in **generators**
28. Relay protection is generally not provided for
 small distribution transformer
 failure of alternator field
 overcurrent in alternator
iv . all of the above
29. For very long high voltage transmission lines, the system of overcurrent protection used is **distance protection**
30. The overvoltages in a power system may be caused due to
 lightning
 opening of circuit breaker
 grounding of a conductor
iv. All of the above
31. Resonance in the power system occurs when the inductive reactance of the circuit is **equal to** capacitive reactance of the circuit .
32. In a transmission line, **inductance > capacitance**
33. In the power system ,the resonance rarely occurs at the supply frequency because **circuit capacitance is small**
34. Differential relays are used to protect the equipment against **internal faults**
35. A directional overcurrent protection consists of

overcurrent relay only
power directional relay only

iii . both i and ii in a single relay casing

36. The overhead lines can be protected by
instantaneous overcurrent relays
inverse time overcurrent relays
directional overcurrent relays

iv. All of the above

37. Differential protection in principle is employed for
protection of alternators
protection of transformer
bus-zone protection

iv. All of the above

38. For the protection of arcing ground , we use **none of the above option**

39. For protection against direct lightning stroke ,we use

- i. ground wire
- ii. Lightning arrester

iii . both i and ii

40. For protection against low voltage high frequency oscillations, we use

- I . Capacitors
- ii. Surges absorber

iii. Both i and ii

41. A buchholz relays is

- A gas accuted relay
- Used in oil immersed transformers
- Connected between main tank and conservator

iv. all of the above

42. Distance protection scheme is used for the protection of **overhead lines**

43. The merz-price circulating current scheme is uneconomical for the protection of **overhead lines**

44. For the protection of power system against travelling waves, we use **surges diverters**

45. The earthing screen provides protection against **direct lightning stroke**

46. The chances of faults occurring on transformer are very rare because the are

- Static devices
- Totally enclosed
- Generally oil immersed

iv. all of the above

47. The automatic relay protection is generally not provided for the following alternator faults

- Failure of field
- Overcurrent
- Overspeed

iv. all of the above

48. Differential system of transformer protection provides protection against

- earth-fault only
- phase faults only

iii. both i and ii

49. A surge diverter should be located **close to** The apparatus to be protected.

50. For the successful working of ground wire, the footing resistance of the tower should be **low**

51. The internal cause of overvoltages in a power system is

- Switching surges
- insulation failure
- arcing ground

iv. all of the above

52. A $1/50\mu s$ voltages surge is one which reaches its maximum value in $1\mu s$ and decays to half of its peak value in **50 μs**

53. In power system, the protecting devices provided against overvoltages mainly take care of **lightning surges**

54. Internal cause of overvoltage in a power system may be due to

- Opening a load line
- closing a unloaded line
- insulation failure

iv. all of the above

55. Balanced earth fault protection is generally provided for **small size alternator**

56. The scheme of protection for transformer depend upon

- size of transformer ,
- nature of load supply ,
- importance of service required

iv. All of the above

57. The amount of damage to the equipment due to voltage surge depends on

- i.the amplitude of the surge
- ii. The steepness of its wavefront

iii. Both i and ii

58. A $1/50\mu s$ surge is **more** Harmful than $3/50\mu s$ surge. Assume the same peak value.

59. As compared to negatively charged clouds , the number of lightening strokes due to the positively charged clouds is **less**
60. A can act as a surge absorber.
- i. capacitor connected between line and earth
 - ii. parallel combination of choke and resistance connected in series with the line
- iii. Either i or ii**
61. Merz-price protection is employed for protection of
1. alternators
 2. transformer
- 3. Both 1 and 2**
62. Merz-price protection is a type of **differential protection**
63. A 10 kva , 400/200 V single-phase transformer with 10 % impedance draws a steady-state short-circuit current of **250 A**
64. For differential protection (delta/delta), the current transformers will have **star-star connection**
65. The impedance relaying scheme is used for the protection of **transmission lines**
66. In case of electro-mechanical relay, relay coil is normally designed for **1 and 5 A**
67. Back-up protection functions when **primary protection fails**
68. Which of the following is the protective device against lightening over-voltages **rod gaps**
- Surge absorbers
 - Horn gaps
- All of the above**
69. Lightening is a huge spark caused by electrical discharge taking place between
- Clouds
 - The same cloud
 - Cloud and earth
- Any of the above**
70. Overhead ground wires are used to protect a transmissions lines against **Voltage surges due to direct lightning strokes**
71. The over-voltages surges in power system may be caused by
- lightning,
 - switching ,
 - resonance
- all of the above**
72. Location of a lightening arrester is near a **transformer**
73. By burden of relay, we generally mean **volt-ampere rating of relay**
74. Under voltage relays are mostly used for **motor protection**
75. Directional over-current relay is used for the protection of **Ring main distribution line**
76. The relation between travelling wave and current wave is given by **$e/i = \sqrt{L/C}$**
77. An efficient and a well designed relaing scheme should be

reliable ,
sensitive ,
selective

all of the above

78. Inverse time-current relays are used for the protection of **alternators**

79. Differential relays are used for protection of

1- feeder

2-altearnators

3-transformers

4-all of the above

80. The protection against direct lightning strokes and high voltage steep waves is provided

by 1-Ground wires

2-Lightning arresters

3-both 1 and 2

V K Mehta Chapter# 32 MCQS

1. The resistivity of a semiconductor **Lies between that of** conductor and insulator.
2. a semiconductor is formed by **Covalent**
3. The most commonly used semiconductor is **Silicon**
4. In a semiconductor, the energy gap between the valence band and conduction band is about **1eV**
5. A semiconductor has**Negative**..... temperature coefficient of resistance.
6. A semiconductor has generally ... **4**..... valence electrons.
7. The resistivity of pure germanium under the standard condition is about **60 Ω cm**
8. The resistivity of pure silicon is about **60,000 Ω cm**
9. When a pure semiconductor is heated, it's resistance **Goes down**
10. The strength of a semiconductor crystal comes from **Electrons-Pairs bonds**
11. When a pentavalent impurity is added to a pure semiconductor it becomes **n-type**
12. Addition of pentavalent impurity to semiconductors creates many **Free Electrons**
13. A pentavalent impurity has **5 Valence electrons**
14. An n-type semiconductor is **Electrically neutral**
15. A trivalent impurity has **3 Valence electrons**
16. Addition of trivalent impurity to a pure semiconductor creates many **Holes**
17. A hole in a semiconductor is defined as **the incomplete part of an electrons pair bond**
18. A pentavalent impurity is called **Donor impurity**
19. The charge of a hole is **Equal to that of an proton**
20. As a general rule, holes are found only in **Semiconductor**
21. The resistivity of an extrinsic semiconductor is about **2Ω cm**
22. The impurity level in a semiconductor is about **1 atom for 10⁸ atoms** of the pure semiconductor.
23. As the doping increases, the bulk resistance of a semiconductor **Decreases**
24. A hole and electron in close proximity would tend to **Attract each other**
25. In a semiconductor, current conduction is due **Holes and free electrons**
26. The random motion of holes and free electrons due to thermal agitation is called **Diffusion**
27. Recombination refers to **Annihilation of holes and electrons**
28. A forward biased PN junction has a resistance of the **Order of Ω**

29. The battery connections required to forward bias PN junction are **+ve terminal to p and -ve terminal to n**
30. The barrier voltage at a PN junction for germanium is about **0.3 V**
31. In the depletion region of a PN junction, there is a shortage of **Holes and electrons**
32. A reversed biased PN Junction has **Almost no current**
33. A PN Junction, acts as a **Unidirectional switch**
34. The leakage current is least in **Silicon**
35. A reverse biased PN junction has a resistance **Of the order of $M\Omega$**
36. The leakage current across a PN Junction is due to **Minority carriers**
37. When the temperature of an extrinsic semi-conductor increase, the pronounced effect is on **Minority carriers**
38. With forward bias to a PN junction the width of the depletion layer **Decreases**
39. The leakage current in a PN junction is of the order of **μA**
40. The valence shell in a silicon atom has the letter designation of **M**
41. Electron-hole pairs are produced by **Thermal energy**
42. The difference between an insulator and a semiconductor is **All of the above**
43. Holes in N-type Semiconductor are **Minority carrier produced by thermal energy**
44. The depletion region is created by **ionization, Diffusion, Recombination, (Answer is all of the above)**
45. The depletion region consists of **(Positive and negative ions) and (No majority carrier) (Answer is both option iv)**
46. The terms BIAS means **D.C voltage applied to an electronic device**
47. When a voltmeter is connected across a forward-biased diode it will read a voltage approximately equal to **Diode barrier potential**
48. When the positive lead of a multimeter is connected to the anode of a diode and the negative lead to the cathode the diode is **Forward Biased**
49. When the voltage is applied to semiconductor holes will flow **Toward negative terminal**
50. At room temperature, a conductor has how many holes? **None**
51. In an intrinsic semiconductor, the number of free electrons **Equals the number of holes**
52. At the absolute zero temperature ($-273^{\circ} C$), an intrinsic semiconductor has **No holes or free electrons**
53. The number of free electrons and holes in an intrinsic semiconductor increase when the temperature **Increase**

54. Which of the following cannot move? **Ions**
55. Which causes the barrier layer in a PN junction? **Recombination**
56. When the reverse voltage increases from 5V to 10V, the depletion layer **Become larger**
57. When a diode is forward biased, the recombination of the free electrons and holes may produce **Heat, Light, Radiation (Answer is All of the above)**
58. A reverse voltage of 20 V is across the diode. What is the voltage across the depletion layer? **20 V**
59. The voltage where the avalanche occurs is called **Breakdown voltage**
60. Suppose an intrinsic semiconductor has 1 billion free electrons at room temperature (25°C). If the temperature changes to 75°C, how many holes are there? **More than 1 Billion**
61. The most widely used semiconductor in electronics device is **Silicon**
62. The energy gap between valence band and conduction band in insulators is about **5 eV**
63. The energy band in which free electrons exist is **Conduction band**
64. The energy gap between valence band and conduction band in conductors is **Zero**
65. The majority carriers in a semiconductor are produced by **Doping**
66. The minority carrier in a semiconductor is produced by **Electron-hole pair**
67. The process of adding an impurity to an intrinsic semiconductor is called **Doping**
68. In an intrinsic semiconductor **Free electrons are thermally produced**
69. When a PN junction is forward biased, the current in the external wires is **By free electrons**
70. When a PN Junction is reversed biased, the current is **By minority carrier in website while By free electrons in book(in my opinion website answer is right)**
71. At room temperature, the charge carries in an intrinsic semiconductor are **Free electrons and holes**
72. The ratio of number of holes and number of free electrons in an intrinsic semiconductor is **1**
73. Doping of germanium with arsenic leads to **N-type semiconductor**
74. A piece of germanium is cooled from room temperature to 100 K. It's conductivity will **Decrease**
75. If the temperature of a piece of germanium increase, its conductance **Increase**
76. Which type of charge carrier has the greatest mobility? **Free Electrons**

77. The resistivity of a semiconductor depends upon its **Temperature**
78. The forbidden energy gap in a conductor is **0 eV**
79. At 0 K, an intrinsic semiconductor behaves as a **Perfect insulator**
80. The current in the external wire for p type semiconductor is by **Free Electron**
81. Ohm's law is not obeyed by **Semiconductor**
82. In a semiconductor crystal, if the current flows due to breakage of crystal bonds, then the semiconductor is called **Intrinsic semiconductor**
83. A P-Type semiconductor is **Uncharged**
84. The energy gap between conduction band and the valence band of a substance is of the order of 0.07 eV. It is **A Conductor**
85. A semiconductor is cooled from T1K to T2K. Its resistance **Will decrease**

Chapter 33

Semiconductor Diodes

- 1) A crystal Diode has **one PN Junction.**
- 2) A crystal diode has forward resistance of the order of **Ω .**
- 3) If the arrow of crystal diode symbol is positive w.r.t bar, then diode is **forward** biased.
- 4) The reverse current in crystal diode is of the order of **μA .**
- 5) The forward voltage drop in a crystal diode is of the order of **0.7V.**
- 6) A crystal diode is used as **a rectifier.**
- 7) The D.C resistance of a crystal diode is **less than** that of its A.C resistance.
- 8) An ideal crystal diode is one which behaves as a perfect **conductor** when forward biased.
- 9) The reverse resistance and forward resistance of crystal diode have a ratio of about **1000:1.**
- 10) The leakage current in a crystal diode is due to **minority carriers.**
- 11) If the temperature of a crystal diode increases, leakage current **increases.**
- 12) The PIV rating of a crystal diode is **lower than** that of equivalent vacuum diode.
- 13) If the doping level of a crystal diode is increased, the breakdown voltage is **decreased.**
- 14) A crystal diode is **non-linear** device.
- 15) A crystal diode utilizes **forward** characteristics for rectification.
- 16) When a crystal diode is used as a rectifier, the most important consideration is **PIV.**
- 17) If the doping level in a crystal diode is increased, the width of depletion region is **decreased.**
- 18) A Zener Diode has **one PN Junction.**
- 19) A zener diode is used as **a voltage regulator.**
- 20) The doping level in a zener diode is **more than** that of a crystal diode.
- 21) A zener diode is always **reverse** connected.
- 22) A zener diode is utilizes **reverse** characteristics for its operation.
- 23) In the breakdown region, a zener diode behaves like a **constant voltage** source.
- 24) A zener diode is destroyed if it **carries more than rated current.**
- 25) A series resistance is connected in the zener circuit to **protect the zener.**
- 26) A zener diode is a **non-linear** device.
- 27) A zener diode has **sharp** breakdown voltage.
- 28) Crystal Diode rectifiers are generally used for **low voltage** applications.

- 29) The forward voltage drop across a crystal diode as the load demand varies **remains essentially constant.**
- 30) Mains A.C Power is converted into D.C Power for **using in electronics equipment.**
- 31) The maximum rectification efficiency of a half-wave rectifier is **40.6%.**
- 32) In half-wave rectification, if the input frequency is 50Hz, then output has a frequency of **50Hz.**
- 33) The ripple factor of a half-wave rectifier is **1.21.**
- 34) The disadvantage of a half-wave rectifier is that **the output is difficult to filter.**
- 35) The output of a half wave rectifier has A.C component **more than** the D.C component.
- 36) If the A.C input to a half-wave rectifier has an r.m.s value of $400/\sqrt{2}$ volts, the diode PIV rating is **400V.**
- 37) A full wave rectifier is **twice** as effective as full wave rectifier.
- 38) The maximum rectifier efficiency of a full wave rectifier is **81.2%.**
- 39) The ripple factor of a full wave rectifier is **0.48.**
- 40) In full wave rectification, if the input frequency is 50Hz, then output has a frequency of **100Hz.**
- 41) The most widely used rectifier circuit is **bridge type circuit.**
- 42) There is a need of transformer for **Centre-Tap circuit.**
- 43) The A.C component in the output of a full wave rectifier is **less than** the d.c component
- 44) The PIV of each diode in a bridge circuit is **one-half** that of the equivalent centre-tapped transformer.
- 45) The primary function of a centre tapped transformer in a power supply is to **cause the diodes to conduct alternatively.**
- 46) A crystal diode can be used as a rectifier because it offers **high resistance in one direction and low resistance in other direction.**
- 47) Crystal diodes rectifiers can handle **less power than** that of vacuum tube rectifiers.
- 48) For the same secondary voltage, the output voltage from a centre tapped circuit is **one-half** than that of bridge circuit.
- 49) If PIV ratings of a diode is exceeded the diode **is destroyed.**
- 50) A Centre tap circuit utilizes **one-half of** secondary voltages for full wave rectification.
- 51) In practice, dc is obtained by **rectification.**
- 52) The volt ampere ratings of a transformer in bridge circuit is reduced by $\frac{1}{2}$ as compared to that of centre-tapped transformer.

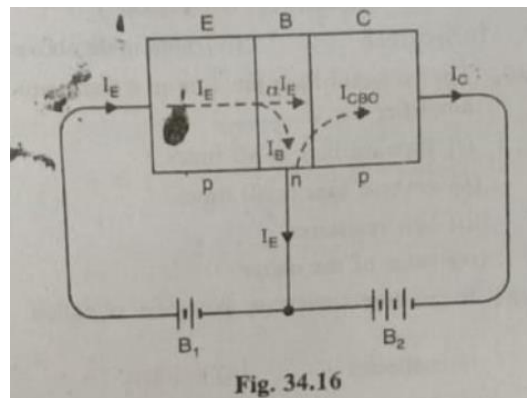
- 53) The function of filter circuit in a power supply is to separate the A.C and D.C component of rectified voltage.
- 54) A 10V power supply would use **electrolytic capacitor** as a filter capacitor.
- 55) A 1000V power supply would use **paper capacitor** as a filter capacitor.
- 56) The **choke input** filter circuit results in the best of regulation.
- 57) If the input frequency of a 3 phase bridge rectifier is 50Hz, then output will have a frequency of **150Hz**.
- 58) The peak value to the input to a half wave rectifier is 10V. The approximate peak value of the output is **9.3V**.
- 59) The peak value to the input to a half wave rectifier is 10V, the diode must be able to withstand a reverse voltage of **10V**.
- 60) The total secondary voltage in a centre-tapped full wave rectifier is 125V R.M.S. Neglecting the diode drop, the r.m.s output voltage is **62.5 V**.
- 61) If the diode drop is included in the above question, the r.m.s output voltage is **61.8 V**.
- 62) When the peak output voltage is 100V, the PIV for each diode in a Centre-tapped full wave rectifier (neglecting diode drop) **200V**.
- 63) When the r.m.s output voltage is 20V, the PIV for each diode in a Centre-tapped full wave rectifier (neglecting diode drop) **28.3V**.
- 64) If the diode drop is included in the above question, the PIV is **24.5V**.
- 65) The ideal DC output voltage of a capacitor filter is equal to the **peak value of rectified voltage**.
- 66) If one of the diodes in a full wave bridge rectifier opens, the output is **half-wave rectified voltage**.
- 67) If you are checking a 50Hz full wave rectifier and observe that output has a 50Hz ripple, **then there is an open diode**.
- 68) A zener diode has a power rating of 4W, and zener voltage of 20V. the maximum current it can safely carry is **200mA**.
- 69) In a half wave rectifier has a ripple voltage of 30V, the ripple voltage in the equivalent full wave rectifier is **15V**.
- 70) A 100V (r.m.s) secondary feeds a silicon rectifier and a filter capacitor with no load. The voltage across capacitor is **140.7 V**.

- 71) The ripple factor in a power supply can be lowered **by increasing the value of filter capacitance.**
- 72) A potentially shorted primary winding of a transformer in a power supply results in **increased rectifier output voltage.**
- 73) A potentially shorted secondary winding of a transformer in a power supply results in **decreased rectifier output voltage.**
- 74) A leaky filter capacitor in a power supply **reduces time constant, discharges rapidly and increases ripple in the output.**
- 75) If the load resistance of a capacitor filtered full wave rectifier is reduced, the ripple voltage **increases.**
- 76) Zener Diodes are primarily used as **voltage regulators.**
- 77) A PN Junction that radiates energy as light instead of as heat is called a **LED.**
- 78) The capacitance of a varactor diode increases when reverse voltage across it
- 79) To display the digit 8 in a seven segment indicator, **all segments must be lighted.**
- 80) A photo-diode is normally **reverse-biased.**
- 81) When the reverse voltage increases, the junction capacitance **decreases.**
- 82) The device associated with voltage controlled capacitance is **varactor diode.**
- 83) The varactor is usually **reverse-biased.**
- 84) When the light increases, the reverse current in a photo-diode **increases.**
- 85) In comparison to a half-wave rectifier, a full wave rectifier gives higher **efficiency, average DC and average output voltage.**
- 86) A half wave rectifier is being used to rectify an alternating voltage of frequency 50Hz. The number of pulses of rectified current obtained in one second is **50.**
- 87) For full wave rectification, the minimum number of diodes required is **2.**
- 88) The thickness of depletion region in PN junction is about **10^{-6}**

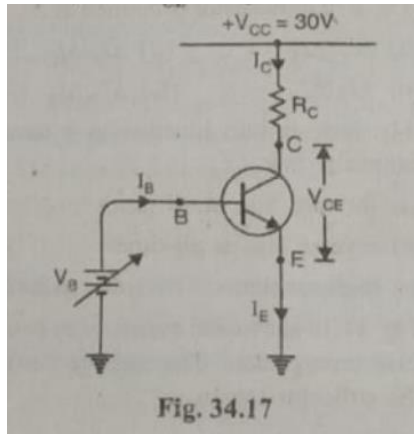
Chapter: 34 (Transistors)

1. A transistor has 2 PN-junctions.
2. The number of depletion layers in transistors is 2]
3. The base of transistor is lightly doped.
4. The element that has the biggest size in a transistor is collector
5. In a pnp transistor the current carriers are holes.
6. The collector of a transistor is moderately doped.
7. A transistor is a current operated device
8. In an npn transistor holes are the minority carriers
9. The emitter of a transistor is heavily doped
10. In a transistor the base current is about 5 percent of emitter
11. At the base emitter junction of a transistor one finds low resistance.
12. The input impedance of a transistor is low.
13. Most of majority carriers from the emitter pass through the base region to the collector.
14. The current I_b is electron current
15. In a transistor $I_e = I_c + I_b$
16. The value of β of transistor less than 1
17. $I_c = \alpha I_e + I_{cbo}$
18. The output impedance of a transistor is high
19. In a transistor $I_c = 100\text{mA}$, $I_e = 100.5\text{mA}$, $I_b = 200\text{mA}$
20. In a transistor $\beta = 100$, collector current is 10mA , $I_e = 10.1\text{mA}$
21. The relation between β and α is $\beta = \alpha / (1 - \alpha)$
22. The value of β for a transistor is generally between 20 and 500.
23. The most commonly used transistor arrangement is common emitter arrangement.
24. The input impedance of a transistor connected in common collector arrangement is the highest.
25. The output impedance of a transistor connected in common base arrangement is the highest.
26. The phase difference between the input and the output voltages in a common base arrangement is 0° .
27. The power gain of a transistor connected in common emitter arrangement is the highest.
28. The phase difference between the input and the output voltages in a transistor connected in common emitter is 180° .
29. The voltage gain of a transistor connected in common emitter arrangement is the highest.
30. As the temperature of the transistor goes up the base emitter resistance is decreased.
31. The voltage gain of a transistor connected in common collector arrangement is less than 1.
32. The phase difference between the input and the output voltages of a transistor in a common collector arrangement is 0°
33. $I_c = \beta I_b + I_{CEO}$
34. $I_c = (\alpha / (1 - \alpha)) I_b + I_{CEO}$
35. $I_c = \alpha / (1 - \alpha) I_b + I_{CBO} / (1 - \alpha)$
36. BC147 transistor indicates that it is made of silicon
37. $I_{CEO} = (1 + \beta) I_{CBO}$

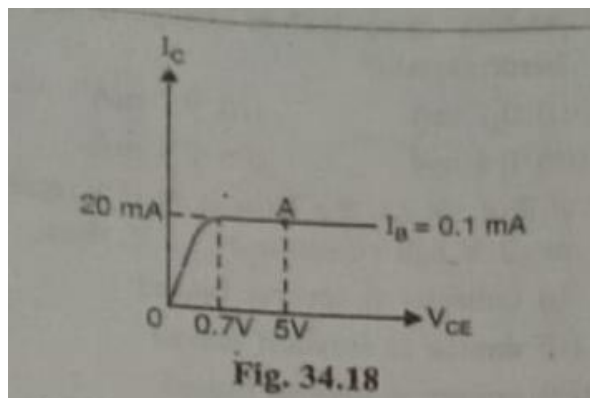
38. A transistor is connected in CB mode, if it is now connected in CE mode with same base voltages the value of I_E , I_B and I_C will remain the same.
39. If the value of alpha is 0.9 then the value of beta is 9.
40. In a transistor signal is transferred from a low resistance to high resistance circuit
41. The arrow in the symbol of a transistor indicates the direction of hole current in the emitter
42. The leakage current in CE arrangement is more than that is CB arrangement
43. The heat sink is generally used with the transistor to prevent excessive temp. rise.
44. The most commonly used semiconductor in manufacture of the transistor is silicon
45. The collector base junction in a transistor amplifier has reverse base at all time.
46. In an npn transistor p region is called base
47. In an npn transistor the majority current carriers are electrons
48. Most of the majority carriers from the emitter "none of the above".
49. The value of alpha of a transistor is defined as $\Delta I_C / \Delta I_E$
50. In a transistor $I_C = 9.5\text{mA}$, $I_E = 20\text{mA}$, then $\alpha = 0.95$
51. The beta of a transistor is defined as $\Delta I_C / \Delta I_B$
52. The base emitter junction in a transistor amplifier has forward base at all time.
53. The fig.34.16 shows the transistor in common base arrangement, the leakage current in the collector region is I_{CBO}



54. In the above question, what is the total collector current, $I_C = \alpha I_E + I_{CBO}$
55. In question 53, if $I_E = 1\text{mA}$, $\alpha = 0.9$, and $I_{CBO} = 10\mu\text{A}$, what will be the value of $I_C = 0.91\text{mA}$
56. If reverse base voltage, B_2 in fig 34.16 is increased then I_{CBO} is unchanged.
57. In fig 34.16, if we neglect I_{CBO} , being small, then the value of $I_C = \alpha I_E$
58. In fig 34.17, if $V_{CB} = 4\text{V}$, $V_{BE} = 0.7\text{V}$, then $V_{CE} = ? \dots 4.7\text{V}$



59. If $V_{CE}=10\text{v}$, $R_c=10\text{kohm}$, in fig. 34.17 what will be voltage across R_C ? 20V
60. In the above question, what will be $I_c=2\text{mA}$
61. If in fig 34.17, $R_c=5\text{Kohm}$, what will be the two end points of DC load line...? 6mA,30V
62. If in fig. 34.17 I_b is adjusted to 10nA, while beta is equal to 100, and $R_c=10\text{kohm}$, what will be $V_{ce}=?$ 20v.
63. Refereeing to fig. 34.17, what will happen if ammeter (E) and collector (c) are short circuited? V_{ce} will be zero, I_e = no output
64. Referring to fig. 34.17, what will happen if base(B) and ammeter(e) are short circuited?...input will be zero.
65. Referring to fig. 34.17, what will happen if collector (c) load R_C is short circuited?... V_{ce} will be 30v.
66. fig. 34.18, shows on of the collector curves of a transistor, what is the knee voltages....? ...0.7V



67. in fig. 34.18, what will be the value of beta at A?... 200
68. fig. 34.19 shows the output characteristics of a transistor and DC load line, what will be operating point when base current is 10uA?... 15V,1mA

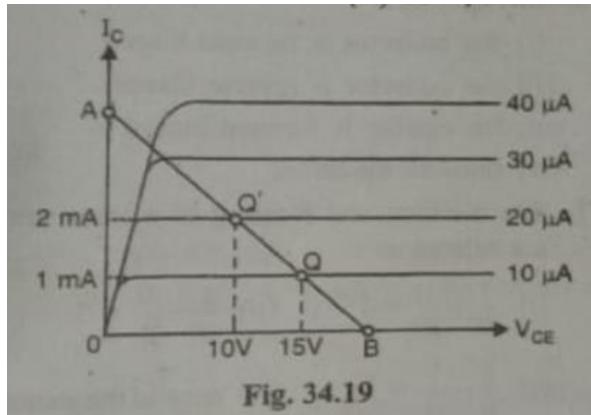


Fig. 34.19

69. fig. 34.19, what will be operating point when base current is $10\mu\text{A}$, ?... $10\text{V}, 2\text{mA}$

70. fig. 34.20(1), shows the transistor circuit and fig. 34.20(2) its DC load line, what will be value of V_{cc} =?... 12V

71. Referring to fig. 34.20(1&2), what will be the value of R_c =?... 2kohm

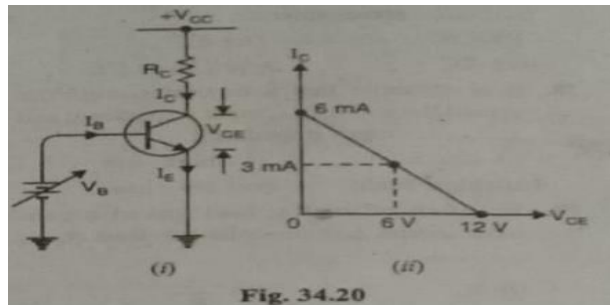


Fig. 34.20

72. Referring to fig. 34.20(2), if $V_{ce}=6\text{V}$, what will be the operating point?... $6\text{V}, 3\text{mA}$

73. The operating point in fig. 34.20 is $6\text{V}, 3\text{mA}$, if $\beta=100$, what will be DC base current?... 0.03mA

74. Fi. 34.21 shows a transistor circuit with open base lead, if $V_{ce}=9\text{V}$, $R_c=1\text{Mohm}$, what valuedoes I_{CEO} has?... $1\mu\text{A}$

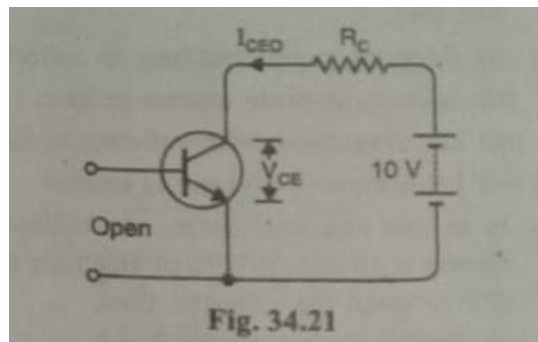


Fig. 34.21

75. If in fig. 34.21, $R_c=10\text{kohm}$, what will be the value of V_{ce} assuming I_{CEO} remains unchanged?... 9.99V

76. If in a transistor, $I_e=10.5\text{mA}$, $I_c=10\text{mA}$, β =?... 20

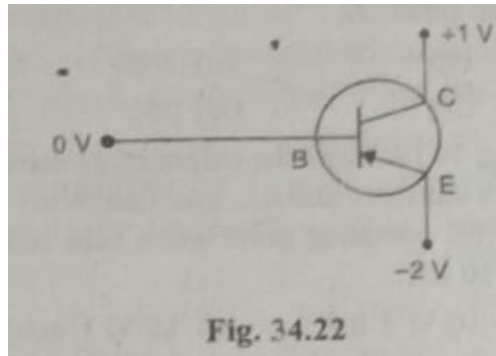
77. A transistor is not generally operated in CC arrangement.

78. It is desirable that a transistor amplifier should have low input impedance and high output impedance

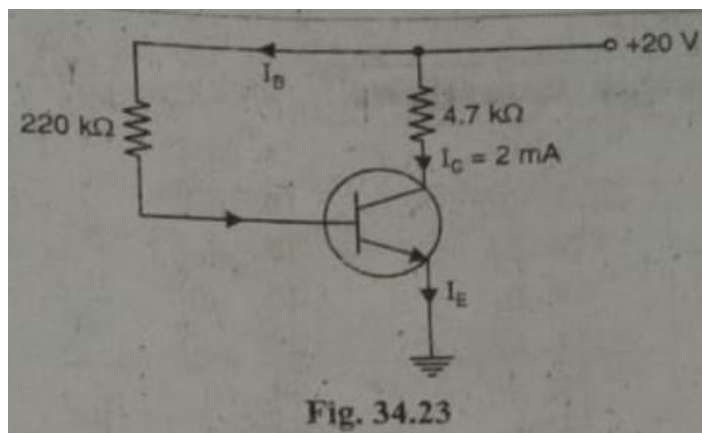
79. The slope of the DC load line of a transistor circuit having collector load R_c is ...?..... $-1/R_c$

80. If in a transistor, $V_{CB}= 4\text{v}$, $V_{BE}=0.7\text{v}$, then $V_{CE}=4.7$

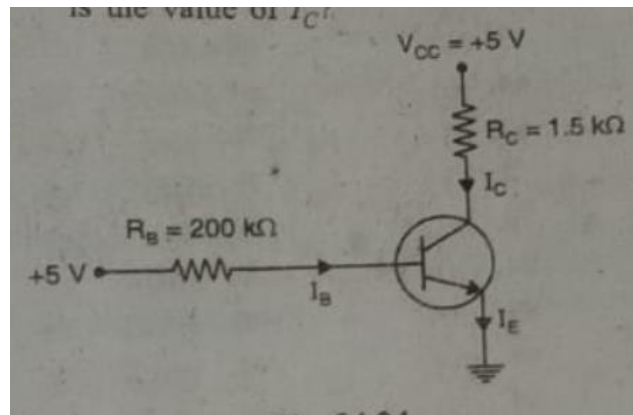
81. The current gain of a transistor in common base mode is 0.99, to change the ammeter current by 5mA the necessary change in collector current is ..?...4.95mA.
82. When npn transistor is used as an amplifier, then electrons move from base to collector.
83. In an npn transistor, circuit the collector current is 10mA, if 90% of electrons are able to reach the collector, then ...?...base current will be 1mA
84. In a silicon transistor, a change of 8mA in the ammeter, the current produces a change of 7.8mA collector current, what change in base current is necessary to produce an equivalent change in the collector current?...0.2mA.
85. In fig. 34.22, the base is at 0v, ammeter is at -2v, and collector is at 1V, then...?...ammeter is reverse biased



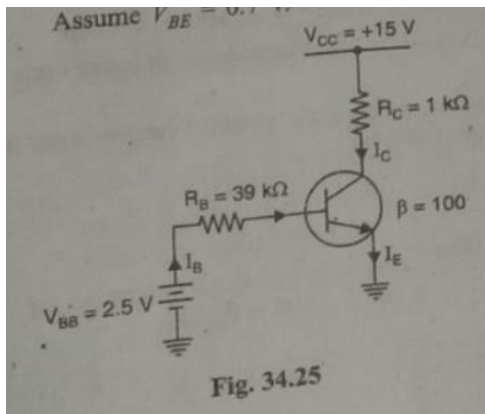
86. In fig. 34.22,.... The collector is forward biased
87. The alpha rating and the beta rating of a transistor are related as... $(1/\alpha) - (1/\beta) = 1$
88. In common transistor, the current gain is 80, what is the change in collector current, then the change in base current is 250uA,?... $80 * 250\mu A$
89. A transistor ($\beta = 100$) is loaded as shown in fig. 34.23, what is the value of I_B ?... 0.02mA
90. In fig. 34.23, what is the value of V_{CE} ?... 10.6V



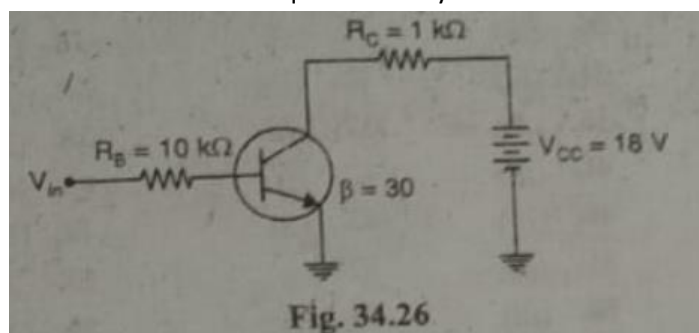
91. In fig. 34.23, what is the value of V_{be} ?... 15.6V
92. In fig. 34.24, $V_{be} = 0$, and $V_{CE} = 0$, what is the value of I_C ?... 3.3mA



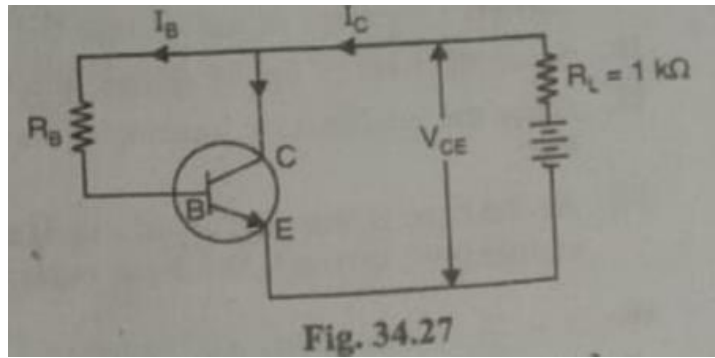
93. In fig. 34.24, what is the value of I_B ?... 25uA
 94. In fig. 34.24, what is the value of beta?... 133.3
 95. In fig. 34.25, what is the value of I_B ?(assume $V_{BE}=0.7V$).. 62.3UA



96. In question 95, I_E =?... 6.29mA
 97. In fig. 34.26,the minimum base current required to fully turn on a transistor is ...?...0.6mA



98. In fig. 34.26, the minimum input voltages required ($V_{BE}=0.7V$) to turn on a transistor is ...?...6.7V
 99. Which of the following approximation is assumed in most practical electronics circuits?... $I_{CE}=I_E$
 100. In the circuit shown in fig. 34.27, the transistor used has a current gain $\beta=100$, what should R_B be the value of R_B so that $V_{CE}=5V$? (neglect V_{BE}).... $10^5\Omega$



Chapter #35

Transistor Biasing

1. Transistor biasing represents **dc conditions**.
2. Transistor biasing is done to keep **proper direct current** in the circuit
3. Operating point represents **zero signal values of I_c and V_{ce}**
4. **Unfaithful amplification** occurs if biasing is not done in an amplifier circuit.
5. Transistor biasing is generally provided by a **biasing circuit**.
6. For a faithful amplification by a transistor circuit the value of V_{be} should **not fall below 0.7V** for a silicon transistor.
7. For proper operation of the transistor its collector should have proper **reverse bias**.
8. For a faithful amplification by a transistor circuit the value of V_{be} should **not fall below 1 V** for a germanium transistor.
9. **Potential divider bias** circuit provides the best stabilisation of operating point.
10. The point of intersection of dc and ac load lines represents **operating point**
11. **An ideal** value of stability factor is **1**
12. The zero signal I_c is generally **1mA** in the initial stages of transistor amplifier.
13. If the maximum collector current due to signal alone is 3mA then zero signal collector current should be at least equal to **3mA**
14. The disadvantage of base bias method of transistor biasing is that **it is insensitive to changes in β** .
15. The biasing circuit has a stability factor of 50. If due to temperature change I_{cbo} changes by 1 μ A then I_c will change by **50 μ A**
16. For a good stabilisation in voltage divider bias the current I_1 flowing through R_1 and R_2 should be equal to or greater than **10 I_b**
17. The leakage current in a silicon transistor is about **one thousandth** the leakage current in a germanium transistor.
18. The operating point is also called the **quiescent point**
19. For proper amplification by a transistor circuit the operating point should be located at **middle** of the dc load line.

20. The operating point also lies on the **ac load line**
21. The disadvantage of voltage divider bias is that it has **many resistors**
22. Thermal runaway occurs when **transistor is not biased**
23. The purpose of resistance in the emitter circuit of a transistor amplifier is to limit the **change in emitter current**
24. In a transistor amplifier circuit $V_{ce} = V_{cb} + V_{be}$
25. The base bias method is generally used in **switching circuits**
26. For a germanium transistor amplifier V_{ce} should **31213 not fall below 0.7V** for faithful amplification
27. In a base bias method if the value of B changes by 50 then collector current will change by a factor of **50**
28. The stability factor of a collector feedback bias circuit is **less than** that of base bias.
29. In the design of a biasing circuit the value of collector load R_c is determined by **V_{ce} consideration**
30. If the value of collector current I_c increase then the value of V_{ce} **decreases**.
31. If the temperature increases the value of V_{be} **decreases**
32. The stabilisation of operating point in potential divider method **is provided by R_e consideration**
33. The value of V_{be} is **almost independent of I_c** .
34. When the temperature changes the operating point is shifted due to **change in I_{cbo}** .
35. The value of stability factor for a base bias is **$(B+1)$** .
36. In a voltage divider biasing circuit the value of R_e is about **800 ohms**.
37. In a voltage divider bias operating point is 3V, 2mA. If $V_{cc}=9V$, $R_c=2.2$ kohms the value of R_e is **800 ohms**.
72. If the value of B is 100 and R_b is 1 Mohm in a base bias method then stability is **101**
73. If I_{cbo} is 1uA and B is 150 then value of I_{cbo} is **151uA**.
74. The maximum value of collector current in a biased transistor is **$I_{C(sat)}$** .
75. A dc load line is a straight line drawn on the collector characteristics curves between **$V_{ce(cut\ off)}$ and $I_{C(sat)}$**

76. The transistor is being driven into **saturation and operating non linearly** if a sinusoidal voltage is applied to the base of a biased npn transistor and the resulting sinusoidal collector voltage is clipped near zero volts.
77. The dc beta for a given type of transistor varies with **temperature and from device to device**
78. The disadvantage of base bias is that it is too much **B dependent**
79. Emitter bias is essentially **dependent of B** and provides a **stable bias point**.
80. In an emitter bias circuit $R_e=2.7 \text{ kohms}$ and $V_{ee}=15V$, the emitter current is **5.3mA**

Chapter 36: Single Stage Transistor Amplifier

1. A single stage transistor amplifier contains **one transistor** and associated circuitry.
2. The phase difference between the output and input voltages of a CE amplifier is **180°**.
3. It is generally desired that a transistor should have **high** input impedance.
4. When an a.c. signal is applied to an amplifier, the operating point moves along **a.c. load line**.
5. If the collector supply is 10V, then the collector cut off voltage under dc condition is **10V**.
6. In the zero signal condition, a transistor sees **d.c.** load.
7. The input capacitor in the amplifier is the **coupling** capacitor.
8. The point of intersection of d.c. and a.c. load lines is called **operating point**.
9. The slope of a.c. load line is **more than** that of d.c. load line.
10. If a transistor amplifier draws 2mA when input voltage is 10 V, then its input impedance is **5kΩ**.
11. When a transistor amplifier is operating, the current in any branch is **sum of a.c. and d.c.**
12. The purpose of capacitors in a transistor amplifier is to **couple or bypass a.c. component**.
13. In the d.c. equivalent circuit of transistor amplifier, the capacitors are considered **open**.
14. In a CE amplifier, voltage gain = $\beta \times \frac{R_{AC}}{R_{in}}$
15. In practice the voltage gain of an amplifier is expressed **in db**.
16. If power and current gains of a transistor amplifier are 16500 and 100 respectively, then the voltage gain is **165**.
17. If R_C and R_L represent collector resistance and load resistance respectively in a single stage transistor amplifier then the a.c. load is $R_C \parallel R_L$.
18. In a CE amplifier, the phase difference between voltage across collector load R_C and signal voltage is **0°**.
19. In the a.c. equivalent circuit of transistor amplifier, the capacitors are considered **short**.
20. In a single stage transistor amplifier, R_C and R_L represent collector resistance and load resistance respectively. The transistor sees a d.c. load of R_C .
21. The purpose of d.c. conditions in a transistor is to **set up operating point**.
22. An amplifier has a power gain of 100. Its db gain is **20db**.

23. In order to get more voltage gain from a transistor amplifier, the transistor used should have **thin base**.
24. The purpose of coupling capacitor in a transistor amplifier is **to pass a.c. and block d.c.**
25. The purpose of emitter capacitor (i.e. capacitor across R_E) is to **avoid voltage gain drop**.
26. The ratio of output to input impedance of a CE amplifier is **moderate**.
27. If a transistor amplifier feed a load of low resistance (e.g. speaker), then the voltage gain will be **low**.
28. If the input capacitor of transistor amplifier is short-circuited, then **biasing conditions will change**.
29. The radio wave picked up by receiving antenna is amplified about a **million** times to have reasonable sound output.
47. The effect of increasing R_C is that the voltage gain **increases**.
48. The effect of increasing R_C beyond a certain limit may result in V_{CE} **falling below V_{knee} and unfaithful amplification**.
49. The change in value of R_C **result in no change in i_C** .
50. Fig 36.17 shows a transistor amplifier circuit. The output can be taken across **R_C and terminal 1 and 2**.

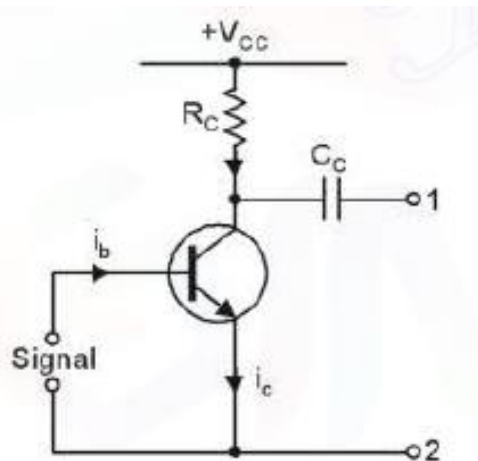


Fig. 36.17

51. Referring to fig. 36.17, the magnitude of output is **same across R_C and terminal 1 & 2**.

52. Referring to fig 36.17 the phase reversal will occur if we take output across **terminal 1& 2.**
53. Referring to fig. 36.17 the purpose of C_C is to **couple the output of one amplifier to next and block d.c.**
54. Referring to fig 36.18, if $R_C = 2k\Omega$, $R_L = 0.2k\Omega$, $\beta = 60$ and $R_{in} = 1k\Omega$. What will be the voltage gain?

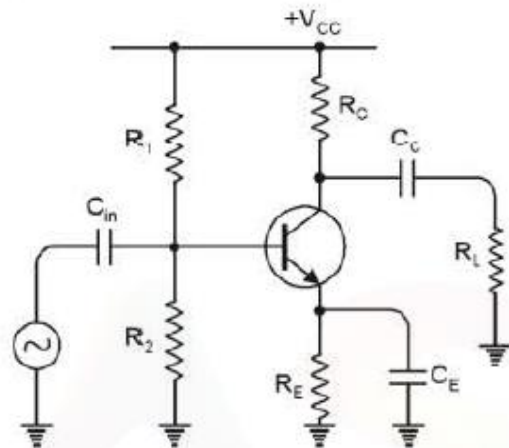
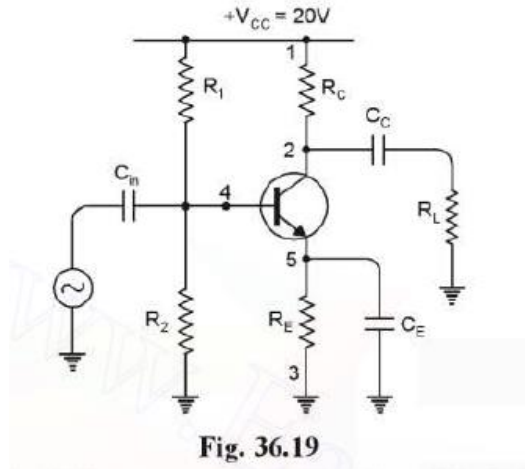


Fig. 36.18

The voltage gain will be **24.**

55. In fig 36.18, the bypass capacitor is C_{E2} .
56. In fig 36.18, the coupling capacitors are C_{in} and C_C .
57. In amplifier circuit shown in fig 36.18, if R_C is short circuited, the output is **zero.**
58. In amplifier circuit shown in fig 36.18, if R_C is open circuited, the output is **zero.**
59. The value of R_C used in fig. 36.18 is generally **high.**
60. If the d.c. voltages measured across capacitors C_{in} , C_E and C_C are 10V, 10V and 13V, then the voltage ratings of these capacitors should be **greater than 10V, 10V and 13V.**
61. If a trouble develops in the amplifier circuit shown in fig 36.19, we first make d.c. measurements.



62. D.c. measurements are preferred in fault location in amplifier circuits than a.c. measurements because **a.c. measurements require costly equipment.**
63. A trouble develops in the amplifier circuit shown in fig. 36.19. On making measurements it is found that dc voltage across terminal 1 and 3 or across 2 and 3 is 20V. What is most probable trouble in the circuit? **R_C is short-circuited.**
64. While trouble shooting the amplifier circuit shown in fig.36.19, following dc measurements were made Voltage across 1 and 2 is 20V, voltage across 2 and 4 is 9.3V, voltage across 4 and 5 is 0.7V.What was trouble in circuit? **R_E is short-circuited.**
65. In fig. 36.19, what fault would affect ac conditions without disturbing dc conditions? **All these (open circuit in C_{in} , open circuit in C_C and open circuit in C_E .)**
66. In fig. 36.19, if C_{in} and C_E are open-circuited, then the signal will be **blocked.**
67. In fig. 36.19, if C_E is open-circuited, then the voltage gain will **reduce drastically.**
68. A leaky capacitor in transistor amplifier would cause **all these (oscillators cease oscillating, oscillators change frequency, amplifiers to lose gain).**
69. In fig.36.19 the dc load is **$R_C + R_E$.**
70. In fig.36.19 the ac load is **$R_C \parallel R_L$.**
71. If the dc emitter current in a certain transistor amplifier is 3mA, the approximate value of r'_e is **8.33 Ω .**
72. A certain common-emitter amplifier has a voltage gain of 100. If the emitter bypass capacitor is removed, **the voltage gain will decrease.**
73. For a common emitter amplifier, $R_C = 1k\Omega$, $R_E = 390\Omega$, $r'_e = 15\Omega$ and $\beta = 75$. Assuming that, R_E is completely bypassed at the operating frequency, the voltage gain is **66.7.**

74. In a common emitter amplifier with voltage divider bias, $R_{in(base)} = 68k\Omega$, $R_1 = 33k\Omega$, $R_2 = 15k\Omega$. The total input resistance is **8.95k Ω** .
75. A CE amplifier is driving a $10k\Omega$ load. If $R_C = 2.2k\Omega$ and $r'_e = 10\Omega$, the voltage gain is approximately **180**.

CHAP 37: MULTISTAGE TRANSISTOR AMPLIFIER

- 1) A radio receiver has **more than three stages** of amplification.
- 2) RC Coupling is used for **voltage** amplification.
- 3) In an RC Coupled amplifier, the voltage over mid frequency range **is constant**.
- 4) In obtaining frequency response curve of an amplifier the **generator output level is held constant**.
- 5) An advantage of RC coupling scheme is the **economy**.
- 6) The best frequency response is of **direct** coupling.
- 7) Transformer coupling is used for **power** amplification.
- 8) In an RC coupling scheme, the coupling capacitor C_c must be large enough **not to attenuate low frequencies**.
- 9) In RC coupling, the value of coupling capacitor is about **10 μ F**.
- 10) The noise factor of an ideal amplifier expressed in db **is 0**.
- 11) When multistage amplifier is to amplify d.c signal , then one must use **direct** coupling.
- 12) **Transformer** coupling produce s the maximum voltage gain.
- 13) In Practice voltage gain is expressed in **db**.
- 14) Transformer coupling provides high efficiency because **d.c resistance is low**.
- 15) Transformer coupling is generally expressed when load resistance is **small**.
- 16) If a three stage amplifier has individual stage gains of 10db,5db and 12db then total gain in db is **27 db**.
- 17) The final stage of multistage amplifier uses **transformer coupling**.
- 18) The ear is not sensitive to **frequency distortion**.
- 19) RC coupling is not used to amplify extremely low frequencies because **there is hum in the output**.
- 20) In transistor amplifier we use **same turn ratio** for impedance matching.
- 21) The lower and upper cutoff frequencies are **half power** frequencies.
- 22) A gain of 1,000,00 time in power is expressed by **60db**.
- 23) A gain of 1,000,00 time in voltage is expressed by **60db**.

- 24) 1db correspond to **40%** change in voltage or current level.
- 25) 1db correspond to **26 %** change in power level.
- 26) The frequency response of transformer coupling is **poor**.
- 27) In the initial stage of a multistage amplifier we use **RC coupling**.
- 28) The total gain of multistage amplifier is less than product of gain of individual stages due to **loading effect of next stage**.
- 29) The gain of an amplifier is expressed in db is because **human ear response is logarithmic**.
- 30) If power level of an amplifier reduces to half , the db gain will fall by **3db**.
- 31) A current amplification of 2000 is a gain of **66db**
- 32) An amplifier receives 0.1 w of input signal and delivers 15 w of signal power. what is the power gain in db? **21.8db**
- 33) The power output of an audio system is 18W. For a person to notice an increase in the output of the system, what must the output power be increased to ? **none of the above**
- 34) The output of a microphone is rated at -52 db. The reference level is 1V under specified sound conditions. What is the output voltage of this microphone under the same sound conditions? **3.8mV**
- 35) RC coupling is generally confined to low power application because of **low efficiency**.
- 36) The number of stages that cab be directly coupled is limited because **changes in temperature cause thermal instability**.
- 37) The purpose of RC or transformer coupling is to **separate bias of one stage from another**.
- 38) The upper or lower cutoff frequency is also called **3db** frequency.
- 39) The bandwidth of a single stage amplifier is **more than** that of a multistage amplifier.
- 40) The value of emitter capacitor C_E in a multistage amplifier is about **50uF**