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CONTENTS

UNIT-I

NETWORK THEORY

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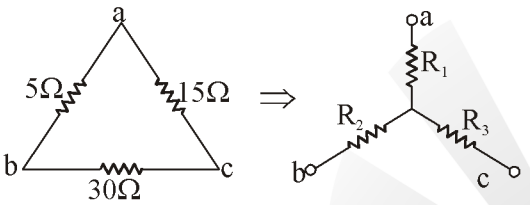
CHAPTER 1

BASICS OF CIRCUIT AND CIRCUIT LAW

OBJECTIVE QUESTIONS

1. A delta connected network with its Y-equivalent is shown in figure. The resistances R_1, R_2 and R_3 (in ohms) are respectively



(a) 1.5, 3 and 9 (b) 3, 9 and 1.5

(c) 9, 3 and 1.5 (d) 3, 1.5 and 9

2. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled then the voltage across each resistor is

(a) Halved

(b) Doubled

(c) Increased by four times

(d) Not changed

3. A 3 H inductor has 2000 turns. How many turns must be added to increase the inductance to 5H?

(a) 1000 turns (b) 2500 turns

(c) 2582 turns (d) 582 turns

4. An electric circuit with 10 branches and 7 nodes will have

(a) 3 loop equations

(b) 4 loop equations

(c) 7 loop equations

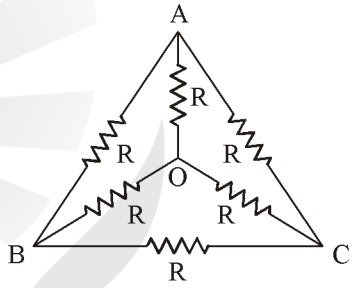
(d) 10 loop equations

5. The response of network is $i(t) = Kt\, e^{-\alpha t}$ for $t \geq 0$ where α is real positive. The value of 't' at which the i(t) will become maximum, is

(a) α (b) 2α

(c) $\frac{1}{\alpha}$ (d) α^2

6. The effective resistance between the terminals A and B in the circuit shown in the figure is



(a) R (b) R–1

(c) $\frac{R}{2}$ (d) $\frac{6}{11}R$

7. If the length of a wire of resistance R is uniformly stretched to n times its original value, its new resistance is

(a) nR (b) $\frac{R}{n}$

(c) n^2R (d) $\frac{R}{n^2}$

8. Two wires A and B of the same material and length L and 2L have radius r and 2r respectively. The ratio of their specific resistance will be

(a) 1 : 1 (b) 2 : 1

(c) 1 : 4 (d) 1 : 8

9. Two incandescent light bulbs of 40 W and 60 W rating are connected in series across the mains. Then

(a) The bulbs together consume 100 W

(b) The bulbs together consume 50 W

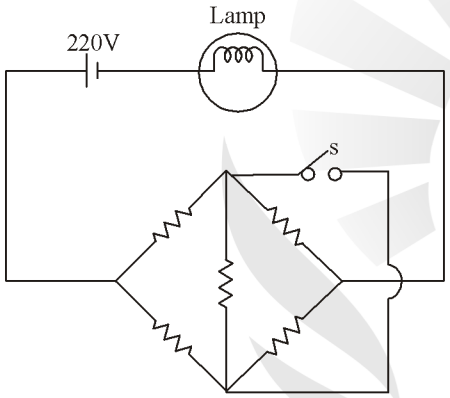
(c) The 60 W bulb glows brighter

(d) The 40 W bulb glows brighter

10. Twelve 1 Ω resistances are used as edges to form a cube. The resistance between the two diagonally opposite corners of the cube is

(a) $\frac{5}{6}\Omega$ (b) 1 Ω (c) $\frac{6}{5}\Omega$ (d) $\frac{3}{2}\Omega$

11. All resistance in the given circuit are at R Ω each. The switch is initially open. What happens to the lamp's intensity when the switch is closed?



(a) Increases

(b) Decreases

(c) Remains the same

(d) Depends on the value of R

12. If each branch of a delta circuit has impedance $\sqrt{3}$ Z, then each branch of equivalent star circuit has impedance would be

(a) $\frac{Z}{\sqrt{3}}$ (b) Z

(c) $2\sqrt{3}$ Z (d) $\frac{Z}{3}$

13. The dual of parallel RC circuit is a

(a) Series RC circuit (b) Series RL circuit

(c) Parallel RC circuit (d) Parallel RL circuit

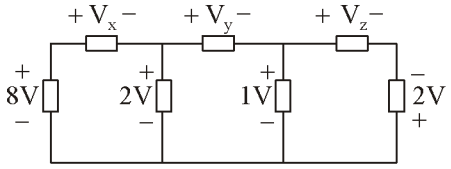
14. Two resistances are connected in parallel and each dissipates 40 W. The total power supplied by the source is equals to

(a) 80 W (b) 40 W

(c) 160 W (d) 20 W

[TNPSC AE - 2018]

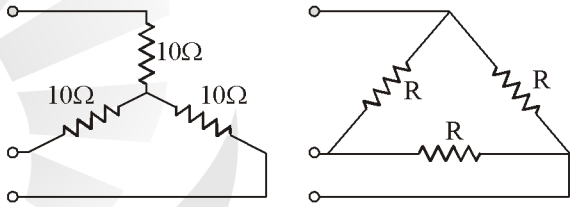
15. The value of V_x, V_y and V_z in figure shown are



(a) –6, 3, –3 (b) –6, –3, 1

(c) 6, 3, 3 (d) 6, 1, 3

16. Star connected load is shown in the figure. The equivalent delta connection has a value of R in Ω is



(a) 10 (b) 30

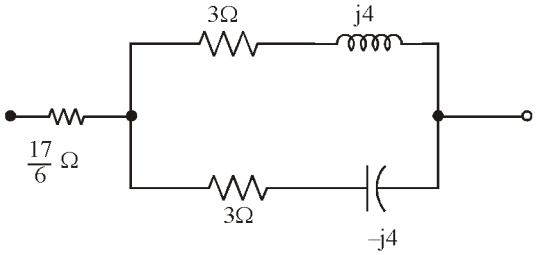
(c) $\frac{10}{3}$ (d) $\frac{20}{3}$

17. A lamp rated at 10 watt, 50 volts is proposed to be used in 110 volts, system. The wattage and resistance of the resistor to be connected in series with the lamp should be

(a) 15 W, 350 Ω (b) 10 W, 250 Ω

(c) 12 W, 300 Ω (d) 15 W, 250 Ω

18. For the circuit shown below the total impedance is



(a) (7 + j0) (b) (5 + j0)

(c) (0 + j8) (d) (7 + j10)

19. ***Assertion (A):*** Two wires of same length with different cross sectional areas are connected in series. The heat produced by the current is more in the thicker wire.

Reason (R): The thicker wire has low resistance.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

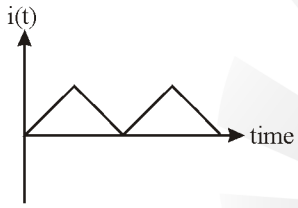
(d) A is false but R is true.

20. What is the power absorbed by a 3-phase load?

(a) $3\ V_L\ I_L \cos\phi$ (b) $\sqrt{3}\ V_L\ I_L \cos\phi$

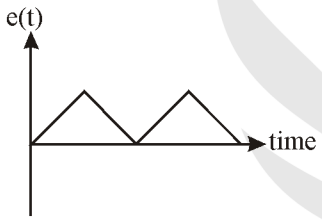
(c) $3\ V_L\ I_L \sin\phi$ (d) $\sqrt{3}\ V_L\ I_L \tan\phi$

21. The waveform of current flowing in a pure inductor is shown in the given figure.

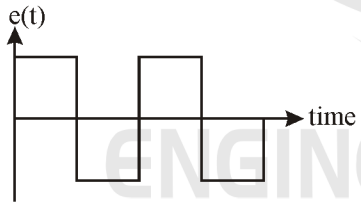


The wave form of the induced voltage in the inductor will be.

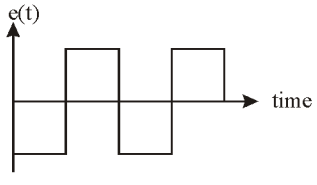
(a)



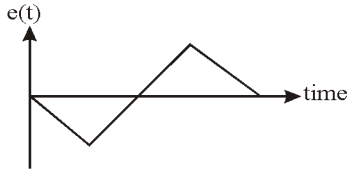
(b)



(c)



(d)



22. In a balanced delta connected resistive load when one resistor is open-circuited, then the power drawn by the load would be

(a) Is reduced by $\frac{1}{3}$ (b) Is increased by $\frac{1}{3}$

(c) Remains same (d) Is reduced by $\frac{1}{2}$

23. A cylindrical block of certain material has a resistance R as measured between its circular faces. To half the resistance, all the dimensions of the block must be

(a) Doubled

(b) Halved

(c) Decreased by $\sqrt{2\pi}$

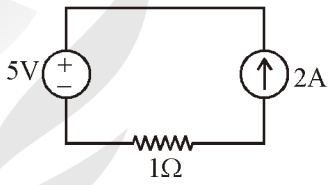
(d) Increased by $\sqrt{2\pi}$

24. The time rate of change of a current passed through a 1mH inductor is 2 mA/s. This means that the voltage across the inductor is.

(a) 0.5×10^{-6} V (b) 0.5 V

(c) 2×10^{-6} V (d) 2 V

25. For the circuit shown in figure



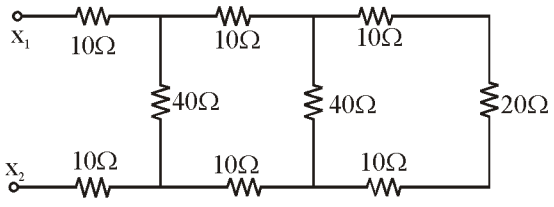
(a) The current depends on the resistor

(b) The Voltage across the current source depends on the resistor.

(c) The current depends on the voltage source

(d) If the resistor were zero, the current would tend to infinity.

26. The approximate equivalent resistance at the points x_1 and x_2 in the circuit shown below



(a) 60 Ω (b) 40 Ω

(c) 80 Ω (d) 20 Ω

27. Two identical resistive loads consumes W watts each when connected in parallel across an ideal current source of I amperes. If, instead, they were connected in series with the same source, their total consumption

(a) Would half

(b) Would double

(c) Would remain the same

(d) Would increase by a factor of 4

28. In a three-phase delta-connected balanced load

(a) Line current is equal to the phase current

(b) Line current is three times the phase current

(c) Line current is $\sqrt{3}$ times the phase current

(d) Line current is the sum of the three phases current

29. Which of the following statement is true?

(a) Thevenin reduction can be used only if there are no current sources

(b) In ac circuits, KCL holds only for average current and not for instantaneous currents.

(c) Capacitors are generally less lossy than inductors

(d) Linear networks can have dependent sources.

30. Two lights bulb of 40W and 80W are connected in series. Which one of the following statement is false?

(a) The current drawn is lesser than what either bulb would draw alone

(b) The voltage across a 80W bulb is lesser than that across the 40W bulb.

(c) The power dissipated by the 80W bulb is lesser than that by the 40W bulb.

(d) The current drawn in the average of what of either bulb would draw alone

31. A house served by a 220V supply light and is protected by a 9 Ampere fuse. The maximum number of 60W bulbs in parallel that can be turned on is

(a) 11 (b) 33

(c) 22 (d) 44

32. The secondary coil of an ideal 2:1 transformer has a 1F capacitor connected across its terminals. The referred impedance on the primary side is of an element

(a) L = 4H (b) C = 0.25 F

(c) L = 0.25 H (d) C = 4F

33. A parallel combination of N resistances is connected an ideal current source of I Amperes. The expression of the current in the k^{th} resistor R_k is

(a) $\left(\frac{R_k}{R_1+R_2+...+R_N}\right)I$ (b) $\left(\frac{\frac{1}{R_k}}{\frac{1}{R_1}+\frac{1}{R_2}+...+\frac{1}{R_N}}\right)I$

(c) $\left(\frac{R_k}{\frac{1}{R_1}+\frac{1}{R_2}+...+\frac{1}{R_n}}\right)I$ (d) $\left(\frac{1}{\frac{R_k}{R_1+R_2+...+R_N}}\right)I$

34. Consider two metallic wires W_1 and W_2 they are made up of same material and each has a circular cross-section. The diameter of W_2 is twice that of W_1 and the length of W_2 is four times that of W_1. Which one of the following statement is TRUE?

(a) Resistance of W_1 is half that of W_2

(b) Resistance of W_1 is equal to that of W_2

(c) Resistance of W_1 is twice that of W_2

(d) Resistance of W_1 is eight times that of W_2

35. Consider the following statements.

1. All the reciprocal networks are always symmetrical
2. All the passive networks are always reciprocal
3. All the non-linear networks are always non-reciprocal

Which of the above statements are TRUE.

(a) 1 and 2 (b) 2 and 3

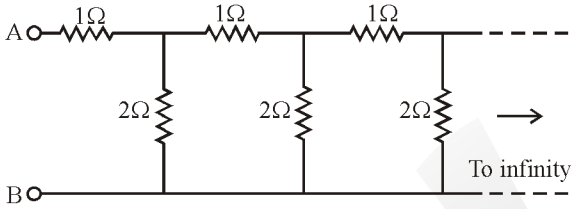
(c) 3 and 1 (d) 1, 2 and 3

36. The resistance of a parallel circuit consisting of two resistors is 12Ω. One of the resistance wires breaks and the effective resistance becomes 18Ω. The resistance of the broken wire is

(a) 48 Ω (b) 18 Ω

(c) 36 Ω (d) 24 Ω

37. The approximate equivalent resistance between terminals A and B for the following infinite ladder network comprising of 1 Ω and 2 Ω resistors is



(a) 1 Ω (b) 2 Ω

(c) 4 Ω (d) 0.5 Ω

38. A practical current source is usually represented by

(a) A resistance in series with an ideal current source

(b) A resistance in parallel with an ideal current source

(c) A resistance in parallel with an ideal voltage source

(d) None of the above

39. Two bulbs marked 200 watt, 250 volts and 100 watt, 250 volts are joined in series to 250 volts supply. Power consumed in circuits is

(a) 33 Watt (b) 67 Watt

(c) 100 Watt (d) 300 Watt

40. Two resistance R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances R_1 and R_2 are respectively.

(a) 3 ohms and 6 ohms

(b) 3 ohms and 9 ohms

(c) 1.5 ohms and 3 ohms

(d) 1.5 ohms and 0.5 ohms

41. Which of the following bulbs will have the least resistance?

(a) 220V, 60W (b) 220V, 100W

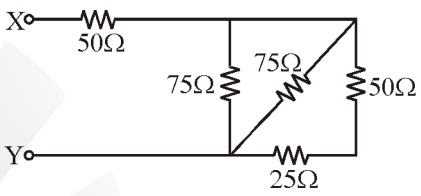
(c) 115V, 60W (d) 115V, 100W

42. A resistance of 5 ohms is further drawn so that its length becomes double. Its resistance will now be.

(a) 5 ohms (b) 7.5 ohms

(c) 10 ohms (d) 20 ohms

43. Equivalent resistance between X and Y is



(a) 75 Ω (b) 50 Ω

(c) 275 Ω (d) None of above

44. Three equal resistors, connected in series across a source of emf, dissipated 10W of power. What would be the power dissipated in the same resistor when they are connected in parallel across the same source?

(a) 10W (b) 30W

(c) 90W (d) 270W

[DMRC JE - 2016]

45. A 10Ω resistor is connected in parallel with a 15Ω resistor and the combination in series with a 12Ω resistor. The equivalent resistance of the circuit is:

(a) 37Ω (b) 27Ω

(c) 18Ω (d) None of these

[DMRC JE - 2016]

46. The energy used by a 1.5kW heater in 5 minutes is:

(a) 450 000 J (b) 450 J

(c) 7500 J (d) None of these

[DMRC JE - 2016]

47. What is called the Electro-Motive Force (EMF) of a voltage source?

(a) Terminal voltage when load is applied

(b) Internal voltage when no load is applied

(c) Product of internal resistance and load current

(d) Electric pressure provided to the load

[DMRC JE - 2016]

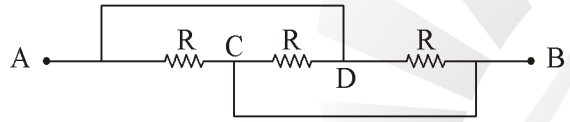
48. One coulomb of electrical charge is contributed by how many electrons?

(a) 0.625×10^{19} (b) 1.6×10^{19}

(c) 10^{19} (d) None of these

[DMRC JE - 2016]

49. Three equal resistors each equal to R ohm are connected as shown in fig. The equivalent resistance between points A and B is:



(a) R (b) 3R

(c) R/3 (d) 2R/3

[DMRC JE - 2016]

50. Two resisters R_1 and R_2 give combined resistance of 6 ohm when in series and 0.83 ohm when in parallel. The resistances R_1 and R_2 are respectively

(a) 3 ohm and 3 ohm

(b) 4 ohm and 2 ohm

(c) 5 ohm and 1 ohm

(d) 4.5 ohm and 1.5 ohm

51. A wire having resistance R_1 is stretched to double its length. The new resistance R_2 is :

(a) R_L (b) $2R_1$

(c) $4R_1$ (d) $\frac{R_1}{2}$

52. How many coulombs of charge move through a filament of a light bulb in 1.3 s If there is 8 A of current through the filament?

(a) 9.3 (b) 10.4

(c) 6.15 (d) None of these

53. What is the current, in amperes, when 0.95 coulombs pass a point in 5 s?

(a) 1.00 (b) 0.19

(c) 4.75 (d) None of these

54. It was found that the current was 60 mA when a circuit with a particular resistance is connected to a 20 V battery. The current has dropped to 30 mA after sometime. How much has the voltage changed?

(a) l0V (b) 20V

(c) OV (d) None of these

55. What is the power consumed by the circuit when a bulb of 60 watts and another of 120 watts are joined in a series?

(a) 180 W (b) 40W

(c) 120 W (d) None of these

56. What is the resistance of a 440 cm long wire of 0.28 cm diameter, with specific resistance 0.56 ohm-cm?

(a) 900 Ω (b) 90 Ω

(c) 9 Ω (d) None of these

57. Three resistors of equal resistance connected in series across a power source together dissipate 15 watts of power. What would be the power dissipated when the same resistors are connected in parallel?

(a) 150W (b) l00W

(c) 135W (d) None of these

58. Which of the following is the unit for measuring specific resistance of a material?

(a) Ohm-meter (b) Ohm

(c) Siemens (d) Ohm/meter

605. The flux through each turn of a 100–turn coil is (t^3-2t)m Wb, where 't' is in seconds. Find the magnitude of the induced emf at t = 2s.

(a) 1 V (b) 0.8 V

(c) 0.4 V (d) 0.2 V

[SSC-JE-2014]

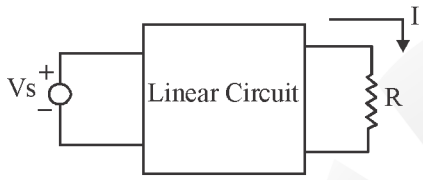
606. For the linear circuit shown in figure,

when R = ∞, V = 20 V;

when R = 0, I = 4 A;

when R = 5Ω,

The current I is.

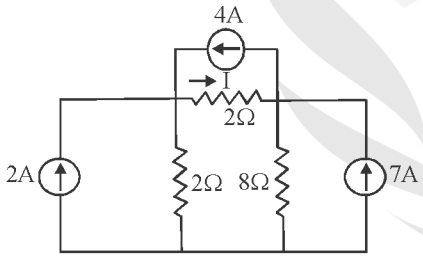


(a) 1 A (b) 2 A

(c) 3 A (d) 4 A

[SSC-JE--2014]

607. The current I in the circuit shown in the figure is.



(a) –3.67 A (b) –1 A

(c) 4 A (d) 6 A

[SSC-JE-2014]

608. The material to be used in the manufacture of a standard resistor should be of:–

(a) Low resistivity

(b) High resistivity and low temperature coefficient.

(c) High temperature coefficient

(d) Low resistivity and high temperature coefficient.

[SSC-JE 2014]

609. A 200 W, 200 V build and a 100W, 200V bulb are connected in series and the voltage of 400V is applied across the series connected bulbs. Under this condition.

(a) 100 W bulb will be brighter than 200W bulb.

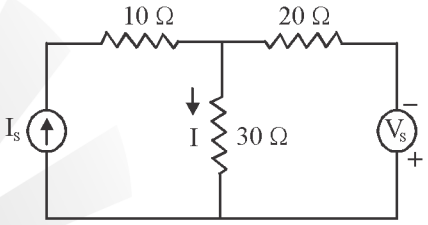
(b) 200 W bulb will be brighter than 100W bulb.

(c) Both the bulb will have equal brightness.

(d) Both the bulb will be darker than when they are connected across rated voltage.

[SSC-JE-2014]

610. For the circuit show in figure, when V_s = 0, I = 3A. When V_s = 200 V. What will be the value of I?



(a) –4 A (b) –1 A

(c) 1 A (d) 7 A

611. The phase angle between the inductor current and the applied voltage is:

(a) 45° (b) 0°

(c) 180° (d) 90°

[HMWS-2015]

612. _____is the unit of electric dipole moment.

(a) m/ coulomb (b) Coulomb –m

(c) Coulomb/m² (d) Coulomb / m

[HMWS-2015]

613. If the electrical susceptibility of a particular material is 'Y', then its.

(a) Relative permittivity is Y – 1

(b) Relative permeability is Y – 1

(c) Relative permittivity is Y +1

(d) None of the above

[HMWS-2015]

614. The best material use for standard resistor is.

(a) Platinum (b) Aluminium

(c) Nichrome (d) Manganin

[HMWS-2015]

615. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled, then the voltage across each resistor is.

(a) Become half

(b) Become double

(c) Increase by four times

(d) Not change

[TGENCO -2015]

616. A battery consists of 'n' series connected cells while voltage of each cell is 'v' volts and capacity 'k'. The voltage and capacity of battery is.

(a) Voltage of battery = n * v, Capacity of battery = Capacity of each cell

(b) Voltage of battery = n * v, capacity of battery = n* capacity of each cell.

(c) Voltage of battery = v, capacity of battery = n* Capacity of each cell.

(d) Voltage of battery = v, Capacity of battery = Capacity of each cell.

[TGENCO -2015]

617. In a pure resistive circuit the average power P_{avg} is _____ the peak power P_{max}

(a) Double (b) One half of

(c) One-fourth (d) Equal to

[TSTRANSCO -2015]

618. Four parallel resistors connected in parallel with five series resistors are connected to a dc supply of 210V. If 'R' is resistance of each resistor and supply current is 5A, then the value of 'R' is.

(a) 42 Ω (b) 441/25 Ω

(c) 10 Ω (d) 882/5 Ω

[TSSPDCL -2015]

619. Choose the instantaneous reactive power of a pure capacitive 1–ϕ ac circuit, if V_m, I_m and f are peak voltage, peak current and frequency of sinusoidal supply.

(a) $0.5V_mI_m \sin 4\pi ft$

(b) $-0.5V_mI_m \sin 2\pi ft$

(c) $-0.5V_mI_m \sin 4\pi ft$

(d) $0.5V_mI_m \sin 2\pi ft$

[TSSPDCL -2015]

❑❑❑

ANSWERS AND EXPLANATIONS

1. *Ans. (a)*

$$R_1 = \frac{R_{ac} \times R_{ab}}{R_{ab} + R_{bc} + R_{ca}}$$

$$= \frac{15 \times 5}{15 + 5 + 30}$$

$$R_1 = \frac{75}{50} = 1.5\Omega$$

$$R_2 = \frac{150}{50} = 3\ \Omega$$

and $$R_3 = \frac{450}{50} = 9\Omega$$

2. *Ans. (d)*

3. *Ans. (d)*

$$L \propto N^2$$

$$\therefore \quad N = 2000\sqrt{\frac{5}{3}} = 2582$$

Added number of turns = 582

4. *Ans. (b)*

(b – n + 1) links associated with fundamental loops.

So, b – n + 1 = 10 – 7 + 1 = 4.

5. *Ans. (c)*

For maximum i(t)

$$\frac{di(t)}{dt} = 0 = e^{-\alpha t}(1 - \alpha t) = 0$$

$$\Rightarrow \quad t = \frac{1}{\alpha}$$

6. *Ans. (c)*

Using Y-Δ conversion

$$R_{eff} = \frac{\frac{3}{4}R \times \frac{3}{2}R}{\frac{3}{4}R + \frac{3}{2}R} = \frac{R}{2}$$

7. *Ans. (c)*

8. *Ans. (a)*

9. *Ans. (d)*

10. *Ans. (a)*

11. *Ans. (c)*

12. *Ans. (a)*

13. *Ans. (b)*

14. *Ans. (a)*

Total power in parallel circuit

= 40 + 40 = 80 W

15. *Ans. (d)*

16. *Ans. (b)*

17. *Ans. (c)*

18. *Ans. (a)*

19. *Ans. (d)*

20. *Ans. (b)*

21. *Ans. (c)*

22. *Ans. (a)*

23. *Ans. (a)*

24. *Ans. (c)*

25. *Ans. (b)*

26. *Ans. (b)*

27. *Ans. (d)*

28. *Ans. (c)*

29. *Ans. (d)*

30. *Ans. (d)*

31. *Ans. (b)*

32. *Ans. (b)*

33. *Ans. (b)*

34. *Ans. (b)*

35. *Ans. (b)*

36. *Ans. (c)*

37. *Ans. (b)*

38. *Ans. (b)*

39. *Ans. (b)*

40. *Ans. (c)*

41. *Ans. (d)*

42. *Ans. (d)*

43. *Ans. (a)*

44. ***Ans. (c)***

$$P_{series} = \frac{V^2}{3R} = 10\ W$$

$$= \frac{V^2}{R} = 30\ W$$

$$P_{parallel} = \frac{3V^2}{R}$$

$$= 3 \times 30 = 90W$$

45. ***Ans. (c)***

$$R_{eq1} = \frac{10 \times 15}{10 + 15} = 6\Omega$$

$$R_{eq} = 12 + 6\Omega = 18\Omega$$

46. ***Ans. (a)***

$$1kwh = 36 \times 10^5 \text{ Joule}$$

$$\text{Total kwh} = 1.5 \times \frac{5}{60}$$

$$= 0.125$$

$$\text{Joule} = 0.125 \times 36 \times 10^5$$

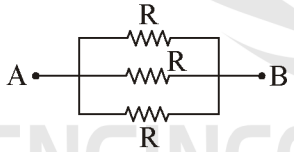
$$\text{Energy} = 450000\ J$$

47. ***Ans. (b)***

48. ***Ans. (a)***

49. ***Ans. (c)***

Redraw the circuit



$$R_{eq} = R \parallel R \parallel R$$

$$= \frac{R}{3}$$

50. ***Ans. (c)***

$$R_{series} = R_1 + R_2$$

$$= 5 + 1 = 6\Omega$$

$$R_{parallel} = \frac{R_1 R_2}{R_1 + R_2}$$

$$= \frac{5 \times 1}{5 + 1} = 0.83$$

51. ***Ans. (c)***

$$R = \frac{\rho l}{a};\ R_1 = \rho \frac{(2l)}{(a/2)}$$

$$R_1 = 4R$$

52. ***Ans. (b)***

$$\frac{dQ}{dt} = 8A$$

$$dQ = 8 \times 1.3$$

$$dQ = 10.4 \text{ coulombs}$$

53. ***Ans. (b)***

$$I = \frac{dQ}{dt} = \frac{0.95}{5}$$

$$I = 0.19\ A$$

54. ***Ans. (a)***

$$R = \frac{V}{I} = \frac{20}{60} \times 10^3$$

$$= 333.33\ \Omega$$

$$V = IR$$

$$= 30 \times 10^{-3} \times \frac{20}{60} \times 10^3$$

$$= 10\ V$$

55. ***Ans. (b)***

$$P = \frac{P_1 \times P_2}{P_1 + P_2}$$

$$= \frac{60 \times 120}{180}$$

$$= 40\ W$$

56. ***Ans. (d)***

Given $\rho = 0.56$ ohm-em

$l = 440$ cm

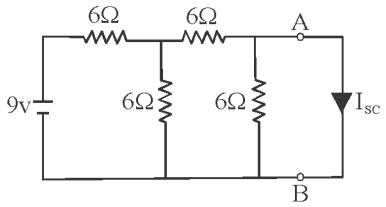
$$a = \frac{\pi \times 0.28 \times 0.28\ cm^2}{4}$$

Resistance $R = \frac{\rho l}{a}$

$$= \frac{0.56 \times 440}{\frac{(\pi \times 0.28 \times 0.28)}{4}}$$

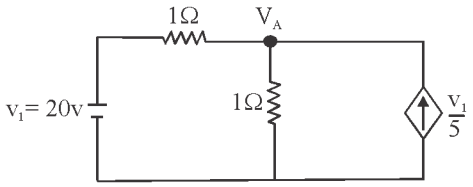
$\Rightarrow$ $R = 4000\ \Omega$

589. ***Ans. (c)***



$I_{SC} = 0.5A$

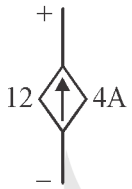
590. ***Ans. (b)***



$$\frac{V_A - 20}{1} + \frac{V_A}{1} = \frac{V_1}{5}$$

$$V_A - 20 + V_A = 4$$

$$V_A = 12 \text{ V}$$



∴ Dependent source 48 W delivers.

591. ***Ans. (c)***

592. ***Ans. (a)***

593. ***Ans. (c)***

$$f(-t) = f(t)$$

For an even function t^2

$$f(t) = f(-t)$$

$$t^2 = (-t)^2$$

So, it is a even function t^4

$$f(t) = f(-t)$$

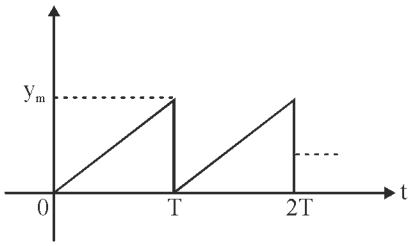
$$t^4 = (-t)^4 = t^4$$

sint, $f(t) = f(-t)$

$$\sin(t) = \sin(-t) \neq -\sin t$$

So, option (c) is the correct choice.

594. ***Ans. (b)***



For smooth wave form,

$$\text{RMS} = \frac{Y_m}{\sqrt{3}}$$

$$f(t) = \frac{Y_m}{T} t, \ 0 < t < T$$

$$\text{RMS} = \sqrt{\frac{1}{T}\int_0^T f(t)^2 dt} = \frac{Y_m}{\sqrt{3}}$$

595. ***Ans. (c)***

596. ***Ans. (b)***

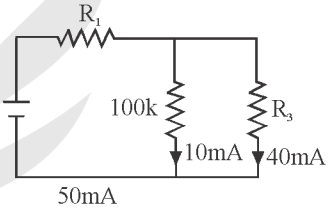
Case-I : $\tan^{-1}\left(\frac{X_L}{R}\right) = \phi$

Case-II : $\tan^{-1}\left(\frac{X_L - X_C}{R}\right) = \phi\downarrow$

ϕ = Phase angle between V and I.

597. ***Ans. (d)***

598. ***Ans. (c)***



$$i_{R_3} = 50A - 10A = 40A$$

Equate the voltage across R_3 and 100 K resistances.

$$100k \times 10mA = 40mA \times R_3$$

$$\Rightarrow \quad R_3 = 25 \text{ k}\Omega$$

599. ***Ans. (d)***

Magnetizing force

$$(H) = \frac{N.I}{L} = \frac{10 \times 750 \times 10^{-3}}{2 \times 10^{-2}}$$

$$(H) = 375 \text{ AT/m}$$

600. ***Ans. (a)***

601. ***Ans. (c)***

$$\text{Voltage } V(t) = \begin{Bmatrix} 30t^2, & t > 0 \\ 0, & t < 0 \end{Bmatrix}$$

$$i = \frac{1}{L}\int V(t)dt = \frac{1}{L}\int 30\, t^2 dt$$

$$= \frac{1}{L}.30.\frac{t^3}{3} \text{ at } 5 \text{ sec}$$

$$= \frac{1}{5} \times 30 \times \frac{5^3}{3} = 250 \text{ A}$$

$$\text{Energy} = \frac{1}{2}Li^2$$

$$= \frac{1}{2} \times 5 \times 250^2$$

$$= 156.25 \text{ kJ}$$

602. ***Ans. (c)***

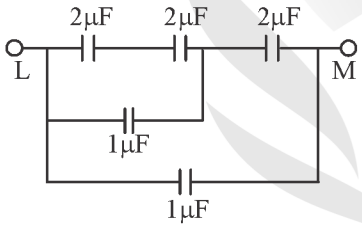
$$R \propto l$$

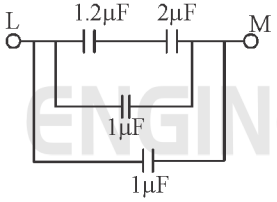
$$\frac{R_A}{R_B} = \frac{\ell_A}{\ell_B}$$

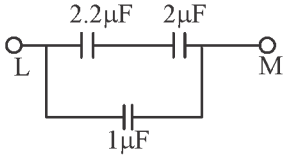
$$\Rightarrow \quad l_A = 8l_B$$

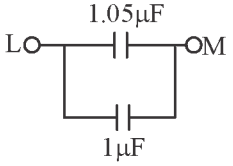
603. ***Ans. (c)***

Given circuit is converted to.









$$\Rightarrow \quad C_{eq.} = 2.05 \text{ μF}$$

604. ***Ans. (b)***

$$\text{Time constant} = \frac{L}{R}$$

$$L \propto N^2 \Rightarrow L_2 = 4L_1$$

$$R \propto N \Rightarrow R_2 = 2R_1$$

$\therefore$ New time constant

$$= \frac{4L_1}{2R_1} = 2.\tau$$

605. ***Ans. (a)***

$$\text{Induced emf (in magnitude)} = \frac{Nd\phi}{dt}$$

$$= (100)(3t^2 - 2) \times 10^{-3}$$

$$= 100(12 - 2) \times 10^{-3} = 1 \text{ V}$$

606. ***Ans. (b)***

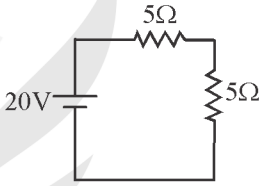
Given, $V_{th} = 20$ V

$I_{SC} = 4$ A

$R_{th} = 5\ \Omega$

Cicuited is represented as,

$$I = \frac{20}{10} = 2 \text{ A}$$



607. ***Ans. (b)***

Apply KVL

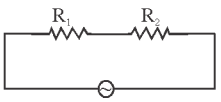
$(6 - I)2 - (3 + I)8 - 2I = 0$

$-12I + 12 - 24 = 0$

$\Rightarrow \quad I = -1$ A

608. ***Ans. (b)***

609. ***Ans. (a)***



$$R_1 = \frac{(200)^2}{200} = 200\ \Omega$$

$$R_2 = \frac{(200)^2}{100} = 400\ \Omega$$

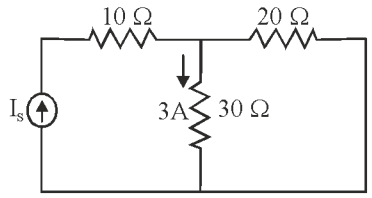
$R_2 > R_1$

So more voltage across R_2 measured.

So 100 W bulb will be brighter than 200 W bulb.

610. ***Ans. (b)***

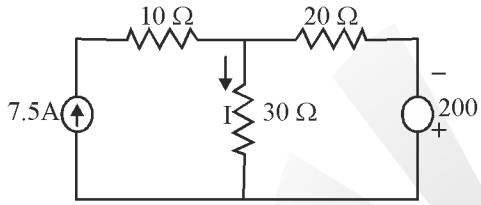
When, $V_s = 0$ circuit becomes.



$$\therefore \quad i_{20} = \frac{30\times 3}{20} = 4.5 \text{ A}$$

$$\therefore \quad I_S = 7.5 \text{ A}$$

When, $V_S = 200$ V



$$7.5 = \frac{V}{30} + \frac{V+200}{20}$$

$$\Rightarrow \quad -2.5 = V\left(\frac{50}{600}\right)$$

$$\Rightarrow \quad V = -30 \text{ V}$$

$$I = \frac{-30}{30} = -1 \text{ A}$$

611. ***Ans. (d)***

In Inductor, $I_L = \frac{V}{j\omega L}$

$$I_L = \frac{V}{j\omega L} \angle -90^\circ$$

$\therefore$ The angle between V and $I_L = 90^\circ$.

612. ***Ans. (b)***

$$m = Q \times d$$

$$m = \text{Coulomb} - m$$

613. ***Ans. (c)***

The electrical susceptibility χ_m is represented as.

$$\chi_m = \varepsilon_r - 1$$

$$\varepsilon_r = \chi_m + 1$$

614. ***Ans. (d)***

The best material used for standard resistor is manganin.

615. ***Ans. (d)***

If value of resistor is doubled, current through it gets halved and hence voltage across it is not changed.

616. ***Ans. (a)***

With cells in series, current must be same as that in a single cell. Hence capacity is same as that of single cell, K.

617. ***Ans. (b)***

Average power

$$p_{avg} = V_{rms}\, I_{rms}$$

$$= \frac{V_m I_m}{2} = \frac{\text{Peak power}}{2}$$

618. ***Ans. (d)***

$$R_{total} = \frac{V}{I} = \frac{210}{5} = 42\ \Omega$$

$$42 = \frac{5R \times \frac{R}{4}}{5R + \frac{R}{4}}$$

$$= 42 \times \left(\frac{200+R}{4}\right) = \frac{5R^2}{4}$$

$$42 \times 21 = 5R$$

$$\Rightarrow \quad \frac{882}{5} = R$$

619. ***Ans. (a), (c)***

$$V = V_m \sin\omega t$$

$$I = I_m \cos\omega t$$

$$P = \frac{V_m I_m}{2} \sin 2\omega t$$

$$= 0.5 V_m I_m \sin 4\pi ft$$

If rective power received by capacitor is treated as +ve, we get option (a).

If rective power delivered by capacitor is treated as –ve, we get option (c).

❑❑❑