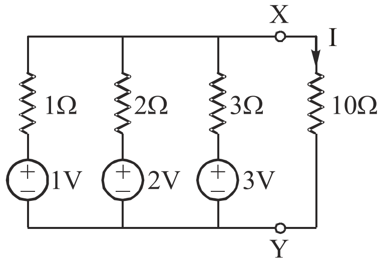
QUESTION BANK

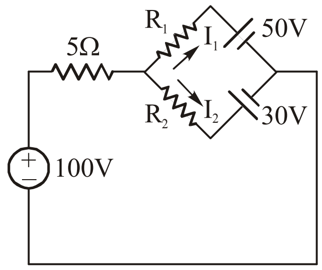
1. Calculate the load current I in the circuit



(a) 3 A (b) 6 A

(c) $\frac{9}{58}$ A (d) $\frac{11}{58}$ A

2. In the circuit shown, what are the values of R_1 and R_2 when the current flowing through R_1 is 1 A and through R_2 is 5 A ?

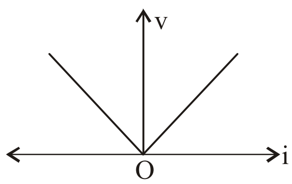


(a) 20 Ω, 8 Ω (b) 12 Ω, 5 Ω
(c) 8 Ω, 12 Ω (d) 8 Ω, 20 Ω

3. A DC voltage source is connected across a series RLC circuit. Under steady state conditions the applied DC voltage drops entirely across the

(a) R only (b) L only
(c) C only (d) R and L

4. The v-i characteristic of an element is shown in the figure given below. The element is

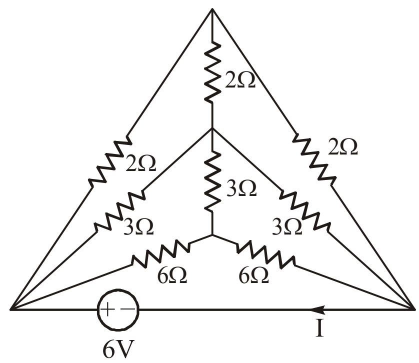


(a) non-linear, active, non-bilateral
(b) linear, active, non-bilateral
(c) non-linear, passive, non-bilateral
(d) non-linear, active, bilateral

5. A 10 mH inductor carries a sinusoidal current of 1 A rms at a frequency of 50 Hz. The average power dissipated by the inductor is

(a) 0 W (b) 0.25 W
(c) 0.5 W (d) 1.0 W

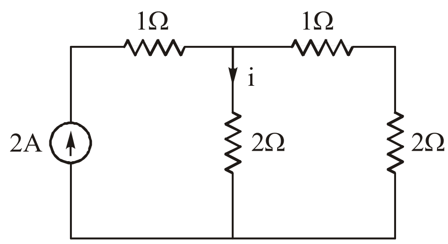
6. Consider the following circuit



What is the value of the current I in the above circuit ?

(a) 1 A (b) 2 A
(c) 3 A (d) 4 A

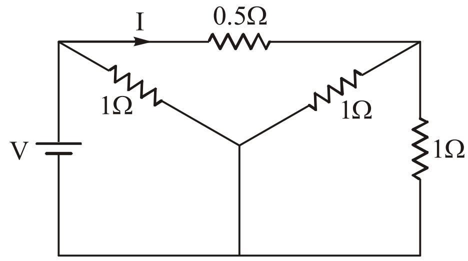
7. In the circuit shown, the current i is



(a) $\frac{4}{5}$ A (b) $\frac{6}{5}$ A

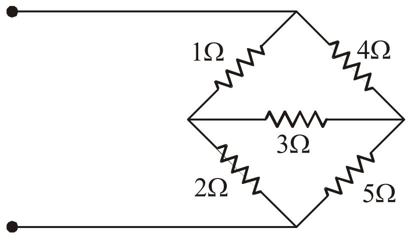
(c) $\frac{2}{5}$ A (d) $\frac{7}{5}$ A

8. In the circuit shown in the figure, if I = 2 A, then the value of the battery voltage V will be



(a) 5 Volt (b) 3 Volt
(c) 2 Volt (d) 1 Volt

9. The input resistance of the circuit shown is



(a) 1 Ω (b) 3.36 Ω
(c) 2.24 Ω (d) 1.12 Ω

10. A 3H 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

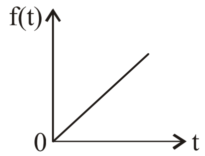
11. The response of network is $i(t) = Kt\, e^{-\alpha t}$ for $t \geq 0$ where α is real positive. The value of 't' at which the i(t) will become maximum, is

(a) α (b) 2α
(c) $1/\alpha$ (d) α^2

12. In a network made up of linear resistors and ideal voltage sources, values of all resistors are doubled. Then the voltage across each resistor is

(a) Doubled
(b) Halved
(c) Decreased four times
(d) Not changed

13. The f(t) signal follows



(a) energy signal
(b) power signal
(c) energy and power
(d) neither energy nor power

14. The ratio of available power from the dc component of a full wave rectified sinusoid to the available power of the rectified sinusoid is

(a) $\frac{8}{\pi}$ (b) $\frac{4\sqrt{2}}{\pi^2}$
(c) $\frac{4\sqrt{2}}{\pi}$ (d) $\frac{8}{\pi^2}$

15. In 220V, 50 Hz AC supply the rms value of AC voltage waveform is

(a) $220\sqrt{2}$ V (b) $\frac{200}{\sqrt{2}}$ V
(c) 220 V (d) None of these

16. For the idealized half wave rectified system the average and rms value of the voltage is

(a) $\frac{V_m}{\pi}, \frac{V_m}{\sqrt{2}}$ respectively

(b) $\frac{V_m}{\pi}, \frac{V_m}{2}$ respectively

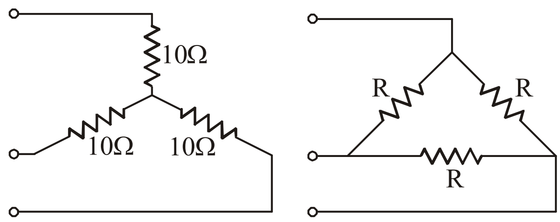
(c) $\frac{2V_m}{\pi}, \frac{V_m}{\sqrt{2}}$ respectively

(d) $\frac{2V_m}{\pi}, \frac{V_m}{2}$ respectively

17. A particular current is made up of two components a 10 A DC and a sinusoidal current of peak value of 14.14 A. The average value of resultant current is

(a) Zero (b) 24.14 A
(c) 10 A (d) 14.14 A

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



(a) 10 (b) 30
(c) $\frac{10}{3}$ (d) $\frac{20}{3}$

19. Kirchhoff's current law is valid for

(a) DC circuit only
(b) AC circuit only
(c) Both DC and AC circuits
(d) Sinusoidal source only

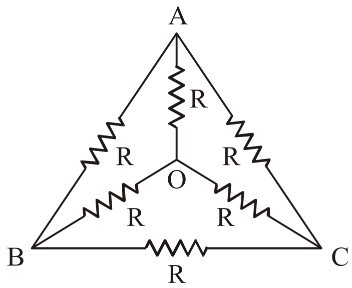
20. The capacitor charging current is

(a) An exponential growth function
(b) An exponential decay function
(c) A linear decay function
(d) A linear rise function

21. A water boiler at home is switched ON to the AC mains supplying power at 230V/50Hz. The frequency of instantaneous power consumed by the boiler is

(a) 0 Hz (b) 50 Hz
(c) 100 Hz (d) 150 Hz

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

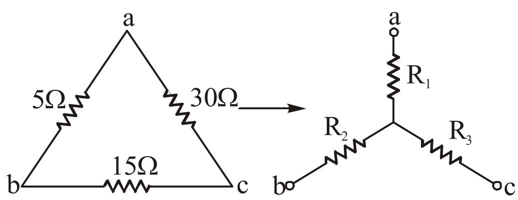


(a) R (b) R–1
(c) $\frac{R}{2}$ (d) $\frac{6}{11}R$

23. The nodal method of circuit analysis is based on

(a) KVL and Ohm's law
(b) KCL and Ohm's law
(c) KCL and KVL
(d) KCL and KVL and Ohm's law

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

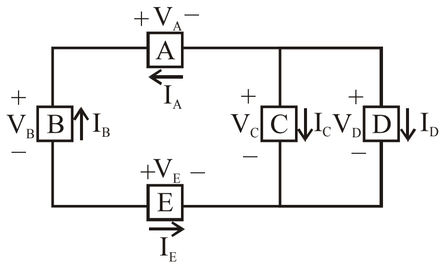


(a) 1.5, 3 and 9
(b) 3, 9 and 1.5
(c) 9, 3 and 1.5
(d) 3, 1.5 and 9

25. If each branch of a Delta circuit has impedance $\sqrt{3}$ Z, then each branch of equivalent Star-circuit has impedance

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

26. Given the following circuit, which of the elements of the circuit have their current direction and voltage polarity in the proper relationship for positive power absorbed by the element?

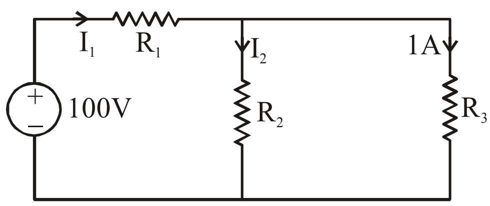


(a) C, D, E (b) A, B, E
(c) A, B (d) C, D

Common Data for Questions 27 to 29

Given the following circuit if

R_2 = 25 Ω, R_3 = 75 Ω



27. Current I_1 is

(a) 1 A (b) 2 A
(c) 3 A (d) 4 A

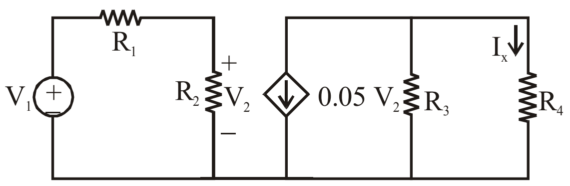
28. Current I_2 is

(a) 1 A (b) 2 A
(c) 3 A (d) 4 A

29. Resistance R_1 is

(a) 3 Ω (b) $\frac{25}{4}$ Ω
(c) $\frac{50}{4}$ Ω (d) $\frac{75}{4}$ Ω

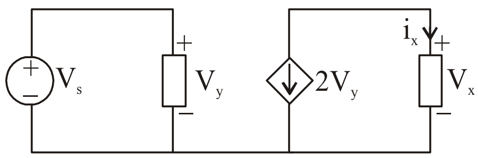
30. For the circuit shown below, given $V_1 = 10$ V, $R_1 = 16$ kΩ, $R_2 = 4$ kΩ, $R_3 = 30$ Ω, $R_4 = 60$ Ω. I_x is



(a) $-\frac{2}{60}$ A (b) $-\frac{1}{60}$ A

(c) $\frac{2}{60}$ A (d) $\frac{1}{60}$ A

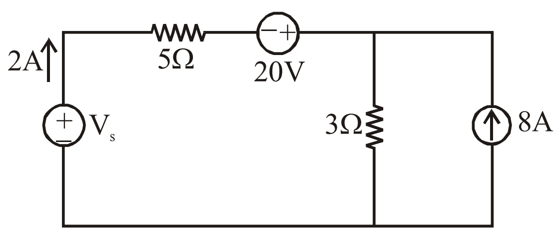
31. For the circuit shown in figure is $V_x = 10$ V and $i_x = 5$ A. The value of V_s is



(a) 5 V (b) 2.5 V
(c) –2.5 V (d) –5 V

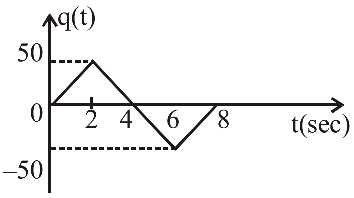
32. The voltage phasor of a circuit is 20∠30°V and the current phasor is 4∠–30°A. The active and reactive powers in the circuit are
(a) 80 W, 69.28 VAR
(b) 40 W, 69.28 VAR
(c) 80 W, 34.64 VAR
(d) 40 W, 34.64 VAR

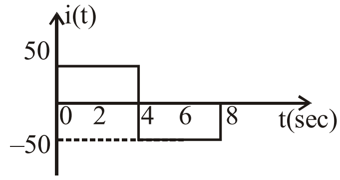
33. For the circuit shown below, V_s is

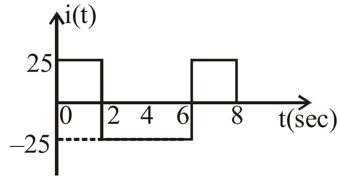


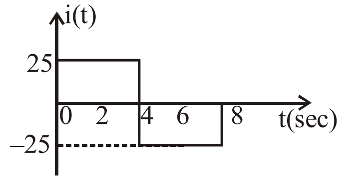
(a) 60 V (b) 40 V
(c) 20 V (d) 10 V

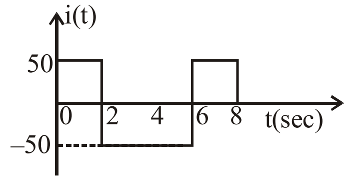
34. The charge flowing in a wire is as shown in figure. The corresponding plot for current is



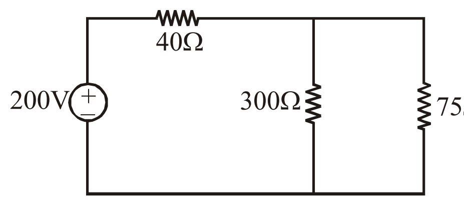
(a)


(b)


(c)


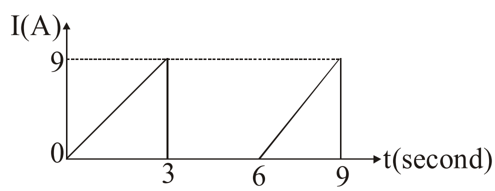
(d)


35. For the circuit shown below, The power delivered by the 200 V source is.



(a) 60 W (b) 48 W
(c) 192 W (d) 400 W

36. The current waveform in a pure resistor of 10 Ω is shown in the given figure, Power dissipated in the resistor is



(a) 3.64 W (b) 26.2 W
(c) 67.5 W (d) 135 W

37. Two current waveforms as shown in the Figure-I and Figure-II, are passed through identical resistors of 1 Ω. The ratio of heat produced in these resistors in a given time by current of Figure-I to Figure-II is

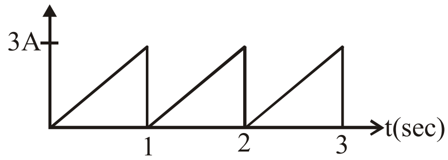


Figure -I

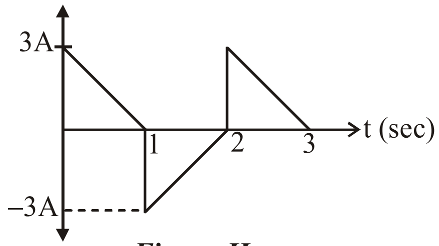
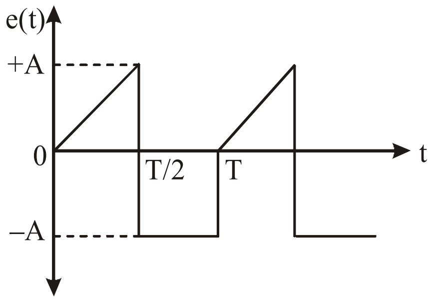


Figure-II

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

(c) 1 : 1 (d) $1:\sqrt{2}$

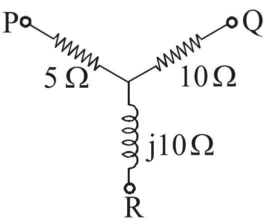
38. The rms value of the periodic waveform e(t), shown in figure is



(a) $\sqrt{\frac{3}{2}}A$ (b) $\sqrt{\frac{2}{3}}A$

(c) $\sqrt{\frac{1}{3}}A$ (d) $\sqrt{2}A$

39. In the delta equivalent of the given star-connected circuit Z_{QR} is equal to



(a) 40Ω (b) $(20 + j\,10)\ \Omega$

(c) $5 + j\left(\frac{10}{3}\right)\Omega$ (d) $(10 + j\,30)\ \Omega$

40. A 3-phase star-connected symmetrical load consumes P watts of power from a balanced supply. If the same load is connected in delta to the same supply, the power consumption will be

(a) P

(b) $\sqrt{3}P$

(c) 3P

(d) Not determinable from the given data

41. Consider the following statements:

1. Resistor dissipates energy

2. Capacitor stores energy

3. Inductor dissipates energy

Which of the above is/are correct?

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

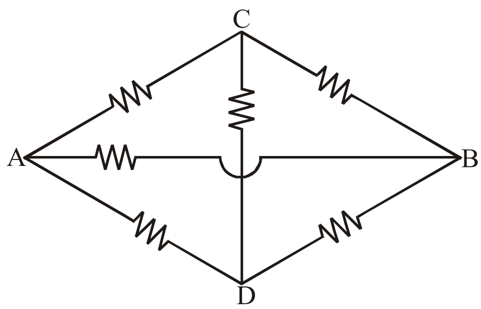
(c) 3 alone (d) 1 and 2

42. 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 resistivity will be

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

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

43. When all the resistances in the circuit are of one ohm each, the equivalent resistance across the points A and B will be



(a) 1 Ω (b) 0.5 Ω

(c) 2 Ω (d) 1.5 Ω

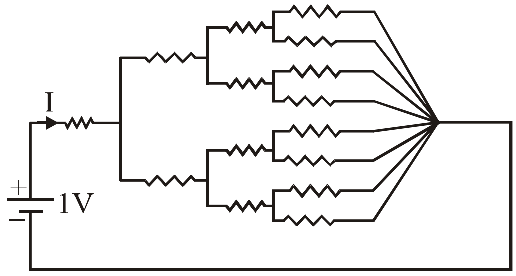
44. Four resistances 80 Ω, 50 Ω, 25 Ω and R are connected in parallel.

Current through 25 Ω resistance is 4 A. Total current of the supply is 10 A. The value of R will be

(a) 66.66 Ω (b) 40.25 Ω

(c) 36.36 Ω (d) 75.56 Ω

45. All the resistances in figure are 1 Ω each. The value of current 'I' is



(a) $\frac{1}{15}$ A (b) $\frac{2}{15}$ A

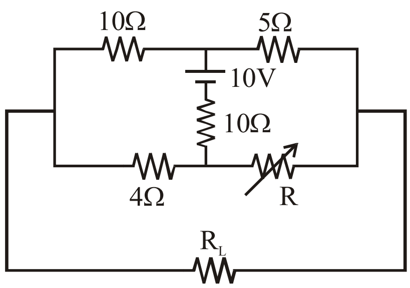
(c) $\frac{4}{15}$ A (d) $\frac{8}{15}$ A

46. ***Assertion (A):*** Kirchoff's voltage law states that a closed path in a network, the algebraic sum of all voltages in a single direction is zero.

Reason (R): Law of conservation of charge is the basis of this law.

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true and R is not the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

47. In the network shown in the given figure, for the current to be zero in R_L, the value of R should be adjusted to



(a) 1Ω (b) 2Ω

(c) 5Ω (d) 10Ω

48. ***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.

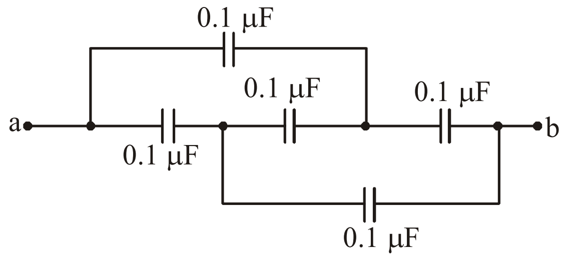
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R true but R is not a correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true

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

(a) $\frac{5}{6}$Ω (b) 1Ω

(c) $\frac{6}{5}$Ω (d) $\frac{3}{2}$Ω

50. The equivalent capacitance across ab will be:



(a) 0.2 μF (b) 0.1 μF

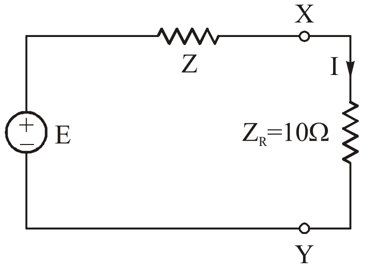
(c) 0.5 μF (d) 0

❑❑❑

ANSWERS AND EXPLANATIONS

1. ***Ans. (c)***

The Millman's equivalent of the circuit is



$$E = \frac{E_1Y_1 + E_2Y_2 + E_3Y_3}{Y_1 + Y_2 + Y_3}$$

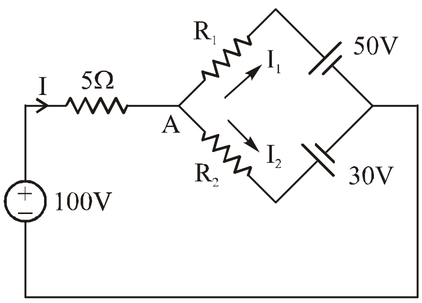
$$= \frac{1\times\frac{1}{1} + 2\times\frac{1}{2} + 3\times\frac{1}{3}}{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}}$$

$$= \frac{18}{11}$$

$$Z = \frac{6}{11}\Omega$$

$$\therefore \quad I = \frac{E}{Z + Z_R} = \frac{9}{58}A$$

2. ***Ans. (a)***



The current through 5Ω resistance is

$$I = I_1 + I_2 = 1 + 5 = 6\ A$$

Voltage across 5 Ω is $V_5 = 5 \times 6 = 30$ V

The voltage at node A is

$$V_A = 100 - 30 = 70\ V$$

$$I_2 = \frac{V_A - 30}{R_2} = \frac{40}{R_2}$$

$$\therefore \quad R_2 = \frac{40}{5} = 8\ \Omega$$

$$\therefore \quad I_1 = \frac{V_A - 50}{R_1} = \frac{20}{R_1} = 1$$

$$\therefore \quad R_1 = 20\ \Omega$$

3. ***Ans. (c)***

4. ***Ans. (a)***

For bilateral element v and i both are negative in reverse direction. The given v-i characteristic represent charging and discharging of a voltage source which is an active element.

5. ***Ans. (a)***

No power is consumed by an inductor.

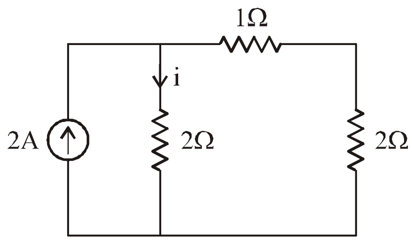
6. ***Ans. (c)***

Circuit is symmetric, so using reciprocity property.

$$I = \frac{6}{2+2} + \frac{6}{3+3} + \frac{6}{6+6} = 3A$$

7. ***Ans. (b)***

The equivalent network is

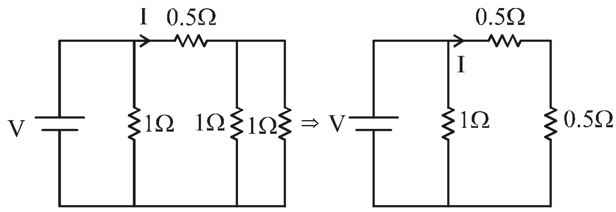


By current divider law

$$i = \frac{3}{5}\times 2 = \frac{6}{5}A$$

8. ***Ans. (c)***

The circuit can be redrawn as



Applying KVL

$$V - 0.5\ I - 0.5\ I = 0$$

$$V = I$$

$$\Rightarrow \quad V = 2\ \text{Volt}$$

9. ***Ans. (c)***

10. ***Ans. (d)***

$$L \propto N^2$$

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

∴ Added number of turns = 582

11. ***Ans. (c)***

For maximum i(t),

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

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

12. ***Ans. (d)***

Ideal voltage source keeps the terminal voltage constant so accordingly current will change and the voltage across each resistor is unchanged following superposition principle.

13. ***Ans. (d)***

This is ramp signal, ramp signal is neither energy signal nor power signal.

14. ***Ans. (d)***

$$\frac{\text{Power from d.c.}}{\text{Power from a.c.}} = \frac{V_0 I_0}{V_s I_s}$$

$$= \frac{\frac{2V_m}{\pi}\cdot\frac{2I_m}{\pi}}{\frac{V_m}{\sqrt{2}}\cdot\frac{I_m}{\sqrt{2}}}$$

$$= \frac{8}{\pi^2}$$

15. ***Ans. (c)***

16. ***Ans. (b)***

17. ***Ans. (c)***

18. ***Ans. (b)***

$$R = \frac{1}{10}[(10\times 10) + (10\times 10) + (10\times 10)] = 30$$

19. ***Ans. (c)***

20. ***Ans. (b)***

21. ***Ans. (c)***

Power = VI

If both V and I have frequency f Hz. Then power will have frequency of 2f Hz.

22. ***Ans. (c)***

Using star-delta conversion

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

23. ***Ans. (b)***

24. ***Ans. (d)***

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

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

$$R_2 = \frac{75}{50} = 1.5\ \Omega$$

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

25. ***Ans. (a)***

26. ***Ans. (a)***

If current enters at positive terminal then it absorbs power and if current enters at negative terminal then it delivers power.

27. ***Ans. (d)***

By current divider rule,

$$1 = \frac{R_2}{R_2+R_3} I_1 = \frac{25}{25+75} I_1$$

$$\Rightarrow \quad I_1 = \frac{100}{25} = 4\ A$$

28. ***Ans. (c)***

$$I_1 = I_2 + 1$$

or $$4 = I_2 + 1$$

$$\Rightarrow \quad I_2 = 3\ A$$

29. ***Ans. (b)***

$$R_2 \parallel R_3 = \frac{25\times 75}{25+100}$$

$$= \frac{25\times 75}{100} = \frac{75}{4}\ \Omega$$

$$I_1 = \frac{V_1}{R_1 + (R_2 \parallel R_3)}$$

$$= \frac{100}{R_1 + \frac{75}{4}}$$

$$4\left(R_1 + \frac{75}{4}\right) = 100$$

$$\Rightarrow \quad R_1 = \frac{25}{4}\ \Omega$$

30. ***Ans. (a)***

$$V_2 = \frac{R_2}{R_1+R_2} V_1$$

$$= \frac{10\times 4}{4+16} = \frac{10\times 4}{20} = 2\ V$$

$$I_x = -\frac{R_3}{R_3+R_4}(0.05V_2)$$

$$I_x = -\frac{30}{30+60}(0.05 \times 2)$$

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

31. ***Ans. (c)***

From the right hand loop we can write,

$i_x = -2V_y$

$5 = -2V_y$

$\Rightarrow \quad V_y = -2.5$ V,

$V_s = V_y = -2.5$ V

32. ***Ans. (b)***

Phase angle $\phi = 30° - (-30°) = 60°$

Active power = $|V|\,|I| \cos\phi = 80 \times \frac{1}{2} = 40$ W

Reactive power = $|V|\,|I| \sin\phi = 80 \times \frac{\sqrt{3}}{2}$

= 69.28 VAR

33. ***Ans. (c)***

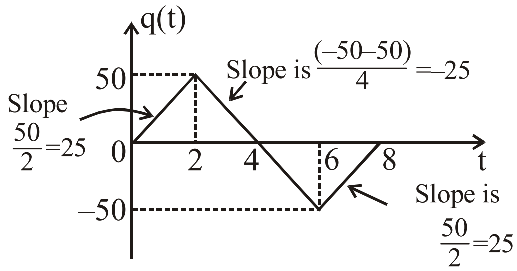
Applying KVL in the loop

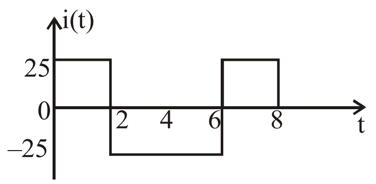
$V_s - 5 \times 2 + 20 - 3 \times 10 = 0$

$\Rightarrow \quad V_s = 20$ V

34. ***Ans. (b)***

Differentiation of straight line is the slope of straight line.





35. ***Ans. (d)***

Current through 200 V source is

$$I = \frac{200}{40+(300 \parallel 75)} = \frac{200}{40+60}$$

$$= \frac{200}{100} = 2\text{ A}$$

Power delivered by 200 V source is

$P = VI = 200 \times 2$

$\Rightarrow \quad P = 400$ W

36. ***Ans. (d)***

$$P = I_{rms}^2 \times 10$$

$$I_{rms} = \sqrt{\frac{1}{T}\left[\int_0^T i^2 dt\right]}$$

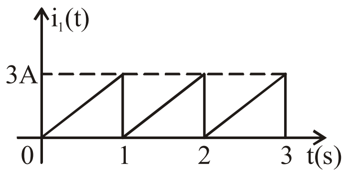
$$I_{rms} = \sqrt{\frac{1}{6}\left[\int_0^3 (3t)^2 dt\right]} = \sqrt{\frac{27}{2}}$$

$$P = I_{rms}^2 \times 10 = \frac{27}{2} \times 10$$

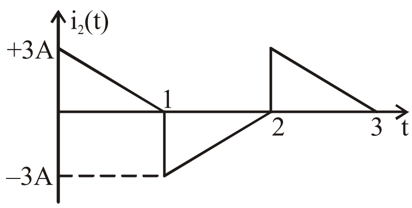
= 135 W

37. ***Ans. (c)***

$$\frac{H_1}{H_2} = \frac{P_{av_1} \times t}{P_{av_2} \times t} = \frac{P_{av_1}}{P_{av_2}}$$



$$P_{av_1} = \frac{R}{T}\int_0^T i_1^2(t)dt = \frac{1}{1}\int_0^1 9t^2 dt = 3$$



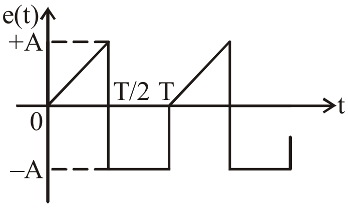
$$P_{av_2} = \frac{R}{T}\int_0^T i_2^2(t)dt$$

$$= \frac{1}{2}\int_0^1 (-3t+3)^2 dt + \frac{1}{2}\int_1^2 (3t-6)^2 dt$$

$$\frac{H_1}{H_2} = \frac{1}{1}$$

Note : *As average value of square of both signal will be same. So, rms vaule of both signal will be same hence power and energy will be same.*

38. ***Ans. (b)***



$$\text{rms value} = \left[\frac{1}{T}\int_0^T e^2(t)dt\right]^{1/2}$$

$$= \left[\frac{1}{T}\int_0^{T/2}\left(\frac{2At}{T}\right)^2 dt + \frac{1}{T}\int_{T/2}^{T} A^2 dt\right]^{1/2}$$

$$= \left[\frac{4A^2}{T^3}\left[\frac{t^3}{3}\right]_0^{T/2} + \frac{A^2}{T}\times\frac{T}{2}\right]^{1/2}$$

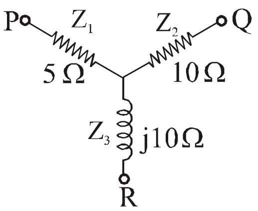
$$= \left[\frac{4A^2}{T^3}\times\frac{1}{3}\times\frac{T^3}{8} + \frac{A^2}{2}\right]^{1/2}$$

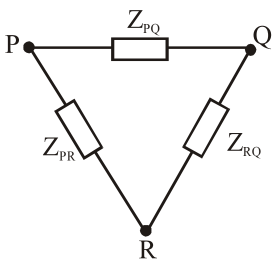
$$= \left[\frac{A^2}{6} + \frac{A^2}{2}\right] = \left[\frac{4A^2}{6}\right]^{1/2} = \sqrt{\frac{2}{3}}A$$

Note : Effective rms value of composit signal

$= \sqrt{\text{sum of square of individual rms value}}$

39. ***Ans. (d)***



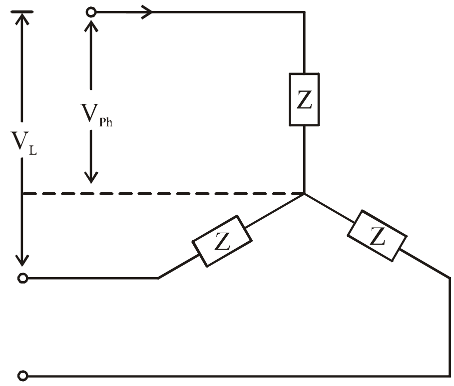


$$Z_{RQ} = Z_2 + Z_3 + \frac{Z_2 Z_3}{Z_1}$$

$$= 10 + j10 + \frac{j100}{5}$$

$$Z_{RQ} = 10 + j30$$

40. ***Ans. (c)***

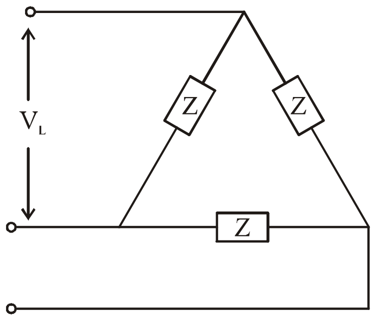


Power in star connection

$P_Y = 3 \times$ (per phase power)

$$= 3\times\frac{(\text{phase voltage})^2}{Z}$$

$$= 3\times\frac{V_{ph}^2}{Z}$$



Power in delta conversion

$P_A = 3 \times$ (Per phase power)

$$= 3\times\frac{(\text{Phase voltage})^2}{Z}$$

$$= 3\times\frac{V_L^2}{Z}$$

$$= 3\times\frac{\left(\sqrt{3}V_{ph}\right)^2}{Z} = 3\times\frac{3V_{ph}^2}{Z}$$

$$P_\Delta = 3\,P_Y$$

41. ***Ans. (d)***

I. Resistance always dissipates power and does not store energy. The power dissipated in resistance is given by,

$$P = I^2R$$

II. Capacitor stores energy in the form of electric field. The energy stored in capacitor is given by,

$$E = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{1}{2}\frac{Q^2}{C}$$

III. Inductor stores the energy in the form of magnetic field. The energy stored in inductor is given by,

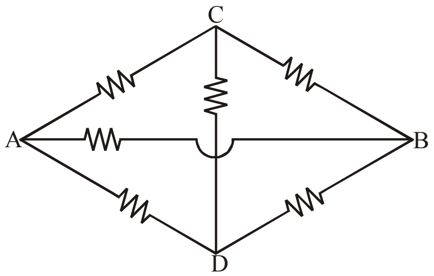
$$E = \frac{1}{2}LI^2$$

42. ***Ans. (a)***

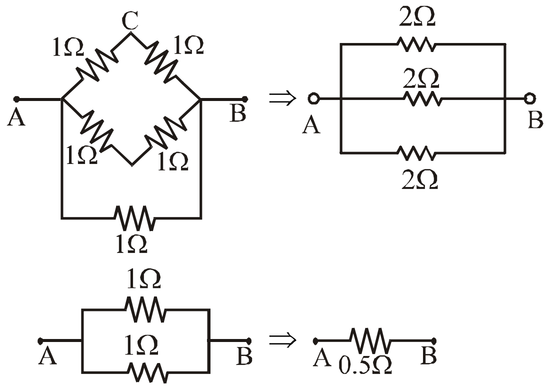
Specific resistivity of the wire depends on the material and temperature but it is independent of dimensions of the wire.

Therefore, $\rho_1 : \rho_2 \Rightarrow 1:1$

43. ***Ans (b)***

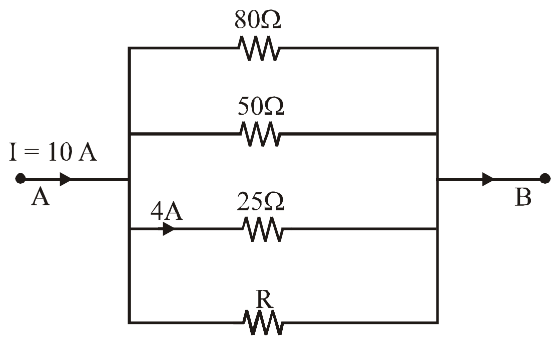


By simplifying the circuit as it will be a balance bridge acoross AB,



Note: *This question may be modified by given different values of R_{AB} & R_{CD} and R_{eq} across AB and R_{eq} across CD then branch removed as balance bridge diagonal will be accordingly.*

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



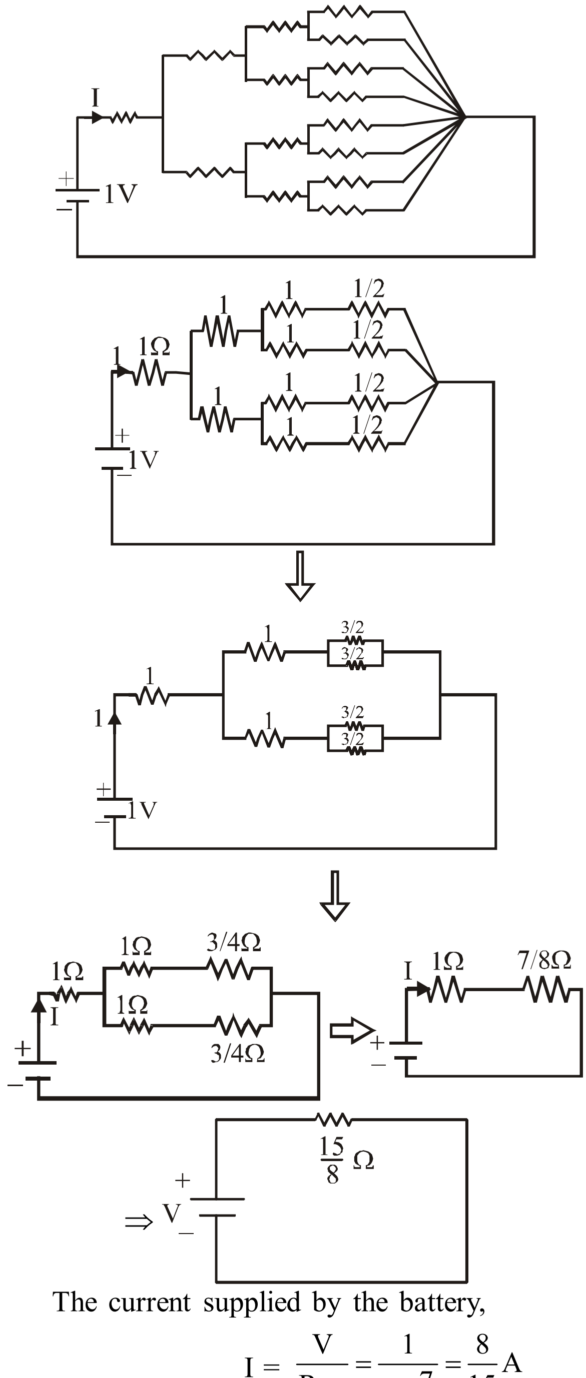
Current through 25 Ω resistance

$$4 = \frac{Y_1}{Y_1 + Y_2 + Y_3 + Y_4}.10$$

$$4 = \frac{\frac{1}{80}}{\frac{1}{80} + \frac{1}{50} + \frac{1}{25} + \frac{1}{R}} \times 10$$

$\Rightarrow$ $R = 36.31\ \Omega$

45. ***Ans. (d)***

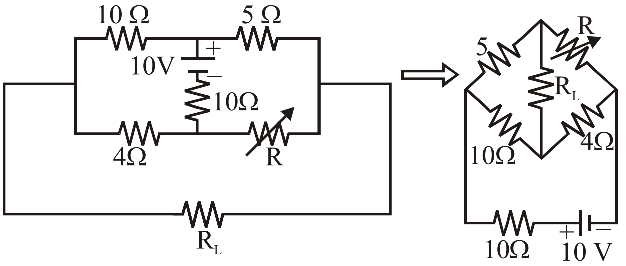


The current supplied by the battery,

$$I = \frac{V}{R_{eq}} = \frac{1}{1 + \frac{7}{8}} = \frac{8}{15} A$$

46. ***Ans. (c)***

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

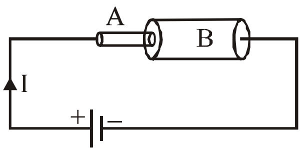


Thus the given circuit represents a bridge circuit. The current through R_L will be zero when the bridge is balanced. The bridge will be balanced when,

$$\frac{5}{10} = \frac{R}{4}$$

$$\Rightarrow \quad R = \frac{5\times 4}{10} = 2\ \Omega$$

48. ***Ans. (d)***



Resistance of a wire is given by,

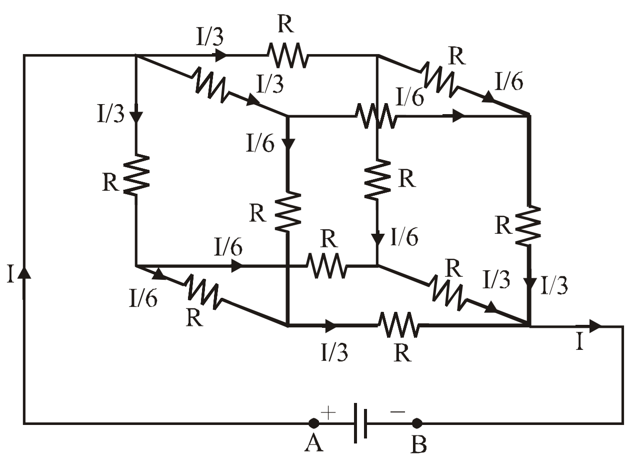
$$R = \frac{\rho L}{A}$$

$$\Rightarrow \quad R \propto \frac{1}{A}$$

The current through both the wires is I. So, heat produced in the wire will depend upon the resistance and the resistance of thiner wire will be higher. So, more heat is dissipated in the thiner wire.

Therefore, assertion is false but reason is true.

49. ***Ans. (a)***



The above network is symmetrical and so the current incoming at a node gets divided equally among the outgoing branches.

Applying KVL in one of the loop including voltage source, we have,

$$V - \frac{I}{3}R - \frac{I}{6}R - \frac{I}{3}R = 0$$

$$\Rightarrow \quad V = \frac{2I}{3}R + \frac{I}{6}R$$

$$\Rightarrow \quad V = \frac{5}{6}RI$$

The equivalent resistance seen by the source,

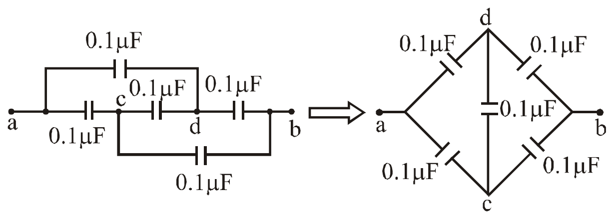
$$\Rightarrow \quad R_{eq} = \frac{V}{1} = \frac{5}{6}R$$

Given, $R = 1$

$$\Rightarrow \quad R_{eq} = \frac{5}{6}\times 1 = \frac{5}{6}\Omega$$

Note: Value of equivalent will be same for inductance but for capacitance will be $\frac{6}{5}$ times.

50. ***Ans. (b)***



Wheatstone bridge is balance so $C_{ab} = 0.1\ \mu F$

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