SSC-JE

Staff Selection Commission Junior Engineer

Recruitment Examination

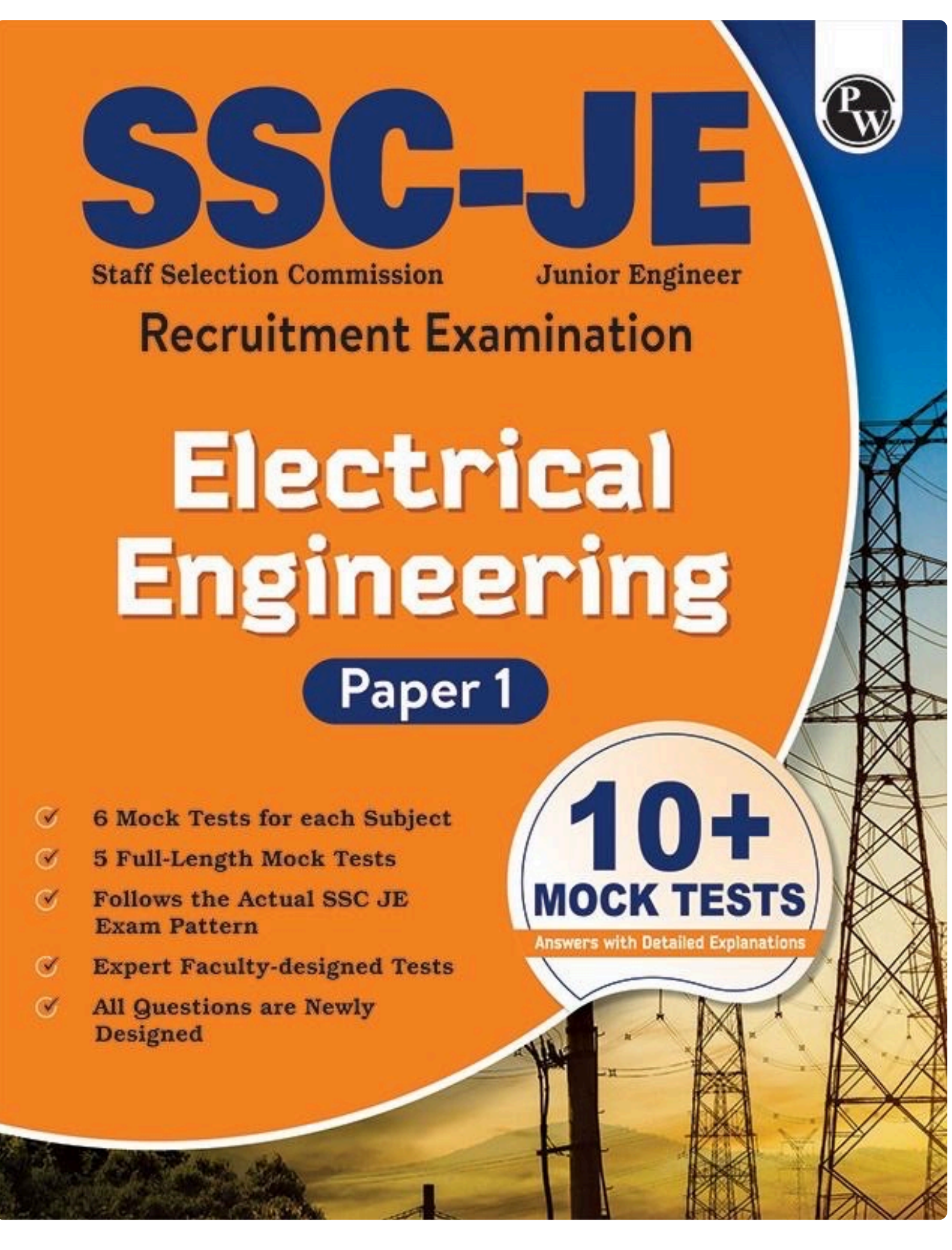
Electrical Engineering

Paper 1

- 6 Mock Tests for each Subject
- 5 Full-Length Mock Tests
- Follows the Actual SSC JE Exam Pattern
- Expert Faculty-designed Tests
- All Questions are Newly Designed

10+ MOCK TESTS

Answers with Detailed Explanations



SSC JE

ELECTRICAL ENGINEERING

6 Subject-wise Mock Tests

5 Full Length Tests

Complete Coverage:

- General Intelligence and Reasoning
- General Awareness
- Electrical Engineering

EDITION: First

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PREFACE

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The first step towards the top is start preparing with PW.

SSC-JE Mock Test Book includes the following attributes:

- Well-Researched Content
- Top-Notch Quality
- Detailed Solution of Each Question
- Exam Relevant Questions

SYLLABUS

PAPER-I

1. **General Intelligence & Reasoning:** The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series, etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.
2. **General Awareness:** Questions will be aimed at testing the candidate's general awareness of the environment around him/her and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.
3. **Electrical Engineering:** Basic concepts, Circuit law, Magnetic Circuit, AC Fundamentals, Measurement and Measuring instruments, Electrical Machines, Fractional Kilowatt Motors and single phase induction Motors, Synchronous Machines, Generation, Transmission and Distribution, Estimation and Costing, Utilization and Electrical Energy, Basic Electronics.

CONTENTS

Mock Tests

Mock Test 1

Subject: Basic Electrical

Total No. of Questions : 25	Time : 20 Minutes	Maximum Marks : 25 Negative Marking : 0.33

1. Two heaters rated at 1000 W, 250 V each are connected in series across a 250 V, 50 Hz AC mains. the total power drawn from the supply would be

(*a*) 1000 W (*b*) 500 W (*c*) 250 W (*d*) 2000 W

2. Specific resistance of a conductor depends upon

(*a*) Dimension of the conductor

(*b*) Composition of conductor material

(*c*) Resistance of the conductor

(*d*) Both (*a*) and (*b*)

3. A voltage source having an open-circuit voltage of 150 V and internal resistance of 75 Ohm is equivalent to a current source of

(*a*) 2 A in series with 75 Ohm

(*b*) 2 A in series with 37.5 Ohm

(*c*) 2 A in parallel with 75 Ohm

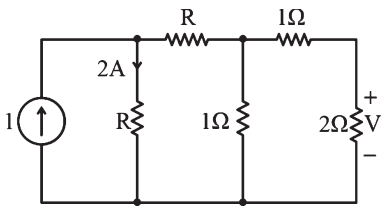
(*d*) 1 A parallel with 150 Ohm

4. The rms value of the voltage $v(t) = 5 + 4\cos 3t$ is_____.

(*a*) $\sqrt{33}$ V (*b*) 5 V

(*c*) 7 V (*d*) $(3+2\sqrt{2})$V

5. What is the value of I for the below shown circuit, if $V = 2$ volts?



(*a*) 2 A (*b*) 4 A (*c*) 6 A (*d*) 8 A

6. Two coupled coils, connected in series have an equivalent inductance of 16 mH or 8 mH depending on the connection. the mutual inductance between the coils is

(*a*) 12 mH (*b*) 82 mH (*c*) 4 mH (*d*) 2 mH

7. An RLC series circuit has $R = 10$ ohm, $L = 2$H. What value of capacitance will make the circuit critically damped?

(*a*) 0.08F (*b*) 0.4F (*c*) 0.02F (*d*) 0.2F

8. If the coefficient of coupling between two coils is increased, mutual inductance between the coils

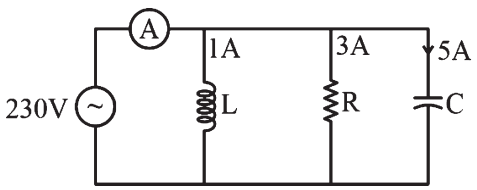
(*a*) Is decreased

(*b*) Remains unchanged

(*c*) Is increased

(*d*) Changes depend on current only

9. The current read by ammeter A in AC circuit shown in following figures is



(*a*) 9 A (*b*) 5 A (*c*) 3 A (*d*) 1 A

10. A certain network consists of a large number of ideal sources and linear resistances, one of which is designated as R and two constant ideal voltage sources. The power consumed by R is P_1 when only the first source is active and P_2 when only the second source is active. If both sources are active simultaneously then the power consumed by R is

(*a*) $P_1 \pm P_2$ (*b*) $\sqrt{P_1} \pm \sqrt{P_2}$

(*c*) $\left(\sqrt{P_1} \pm \sqrt{P_2}\right)^2$ (*d*) $\left(P_1 \pm P_2\right)^2$

11. Which of the following is dimensional formula for conductance?

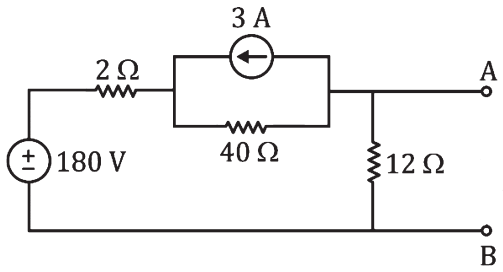
(*a*) $ML^2T^{-3}I^{-1}$ (*b*) $ML^2T^{-3}I^{-2}$

(*c*) $M^{-1}L^{-2}T^3I^2$ (*d*) $MLT^{-3}I$

12. A conductor of diameter D, length L consumes a power of 32 W when a current I flows through it. What will be the power consumed if D is doubled, L is halved and current is tripled ?

(a) 18 W (b) 36 W (c) 72 W (d) 48 W

13. Norton's current at terminal A and B of the circuit shown.



(a) 1.43 A (b) –2 A

(c) 2 A (d) 3 A

14. A coil with a certain number of turns has a specified time constant. If the number of turns is doubled, its time constant will

(a) Remain unaffected (b) Become double

(c) Become four-fold (d) Get halved

15. The function of the depolarizer in a carbon zinc cell is that _____ .

(a) It converts the produced hydrogen into water

(b) It prevents the fast chemical action on the zinc container

(c) It synthesis the decomposed electrolyte

(d) It absorbs the oxygen produced in the cell

16. Midway between to equal and similar charges, a third equal and similar charge is placed. Then this third charge will ____.

(a) Remain in stable equilibrium

(b) Be in unstable equilibrium

(c) Not be in equilibrium

(d) Will move out of the field to influence the two charges

17. Which of the following statements about the zinc carbon cell is true?

(a) The zinc container has a potential of 1.5 V against the carbon electrode.

(b) The air in the air space is needed for the oxidation of zinc.

(c) When current is drawn from the cell, the carbon rod is partly consumed.

(d) The depolarizer mainly contains brown iron ore and carbon powder.

18. Ohm's Law is followed by:

(a) Metal rectifier (b) Copper electrode

(c) Crystal detector (d) Arc lamp

19. Three wires having conductance 2, 3 and 6 mho respectively are connected in parallel in a circuit. The equivalent resistance in the circuit will be:

(a) 11 Ω (b) 1 Ω (c) $\frac{1}{11}\Omega$ (d) 33 Ω

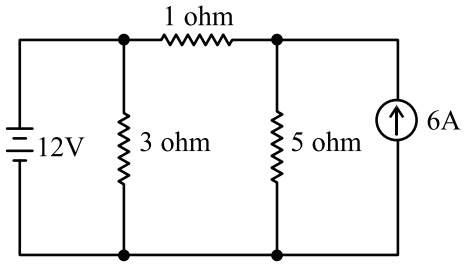
20. What is the SI unit of absolute permittivity of any medium?

(a) $\frac{1}{C}$ (b) $\frac{C^2}{\left(Nm^2\right)}$ (c) $\frac{C^2}{\left(Nm\right)}$ (d) $\frac{\left(Nm\right)}{C^2}$

21. The resistance of a conductor is 5 Ω at 50°C and 6 Ω at 100°C. Calculate its resistance at 0°C.

(a) 2 Ω (b) 1 Ω (c) 4 Ω (d) 3 Ω

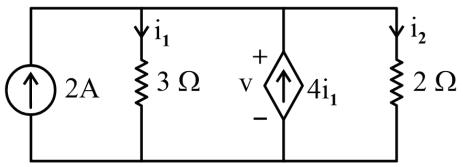
22. In the figure below, the current through the branch containing the voltage source is:



(a) 1 A (b) 4.12A

(c) 3 A (d) 4 A

23. Find the value of the current i_1 in the following circuit.



(a) 3/4 A (b) 4/3 A

(c) –4/3 A (d) 2 A

24. A wire length 50 cm moves at right angles to its length at 50 m/s in a uniform magnetic field of density 1 Wb/m^2. Determine the emf induced in the conductor when the direction of motion is perpendicular to the field.

(a) 2.5 V (b) 15 V (c) 25 V (d) 250 V

25. The inductive reactance of a circuit is 60 ohms when it is supplied with a 50 Hz supply. What will be the value of inductive reactance (in Ohms) of the circuit, if it is supplied with 60 Hz supply?

(a) 72 (b) 86 (c) 94 (d) 105

Answer Key

1. (*b*)	**2.** (*b*)	**3.** (*c*)	**4.** (*a*)	**5.** (*c*)	**6.** (*d*)	**7.** (*a*)	**8.** (*c*)	**9.** (*b*)	**10.** (*c*)
11. (*c*)	**12.** (*b*)	**13.** (*a*)	**14.** (*c*)	**15.** (*a*)	**16.** (*a*)	**17.** (*d*)	**18.** (*b*)	**19.** (*c*)	**20.** (*b*)
21. (*c*)	**22.** (*a*)	**23.** (*c*)	**24.** (*c*)	**25.** (*a*)					

Hints and Solutions

1. (*b*) Two heaters of ratings P_1 and P_2 are connected in series then the total power consumed

$$P_T = \frac{P_1 P_2}{P_1 + P_2}$$

Here both are having same rating

$$\therefore\ P_T = \frac{P}{2} = \frac{1000}{2} = 500 \text{ W}$$

$$\boxed{P_T = 500 \text{ W}}$$

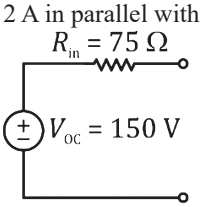
2. (*b*) Specific resistance of the conductor does not depends on dimension of the material. It depends on

(i) Nature of the material

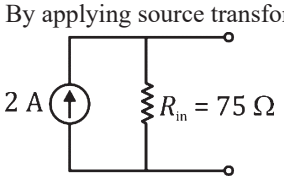
(ii) Its chemical composition

(iii) Its intermolecular arrangement

3. (*c*) 2 A in parallel with 75 Ω.



By applying source transformation



$$I = \frac{V_{OC}}{R_{in}} = \frac{150}{75}$$

$$\boxed{I = 2 \text{ A}}$$

4. (*a*) $v(t) = 5 + 4\cos 3t$

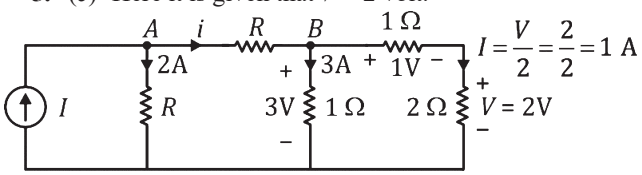
RMS value of $v(t)$

$$V_{rms} = \sqrt{(5)^2 + \left(\frac{4}{\sqrt{2}}\right)^2} = \sqrt{25 + \frac{16}{2}}$$

$$V_{rms} = \sqrt{25 + 8}$$

$$\boxed{V_{rms} = \sqrt{33} \text{ Volt}}$$

5. (*c*) Here it is given that $V = 2$ volt.



Apply KCL at node *B*,

$-i + 3 + 1 = 0$

$i = 4\ A$

KCL at node *A*,

$-I + i + 2 = 0$

$I = 2 + 4 = 6$ A

6. (*d*) If connected in series aiding

$L_{eq} = L_1 + L_2 + 2M = 16$ mH ...(i)

If connected in series opposition

$L_{eq} = L_1 + L_2 - 2M = 8$ mH ...(ii)

Subtract (ii) from (i),

$4M = 16 - 9$

$4M = 8$

$M = 2$ mH

7. (*a*) ∵ damping ratio

$$\xi = \frac{R}{2}\sqrt{\frac{C}{L}}$$

For critically damped system $\xi = 1$

$$\frac{R}{2}\sqrt{\frac{C}{L}} = 1$$

$$\frac{R^2C}{L} = 4$$

$$C = \frac{4L}{R^2} = \frac{4\times 2}{(10)^2} = 0.08 \text{ F}$$

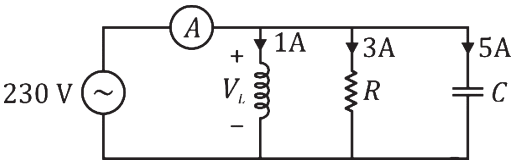
8. (*c*) Coefficient of coupling

$$K = \frac{M}{\sqrt{L_1L_2}}$$

i.e. $\uparrow M = \uparrow K\sqrt{L_1L_2}$

if K increase then M also increases.

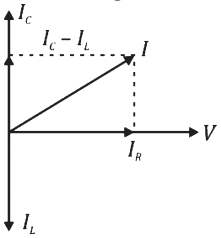
9. (*b*)



Here ammeter reading will be phasor sum of I_R. I_L and I_C

$\therefore\ I = \overrightarrow{I_R}I_R + \overrightarrow{I_L} + \overrightarrow{I_C}$

Phasor diagram:



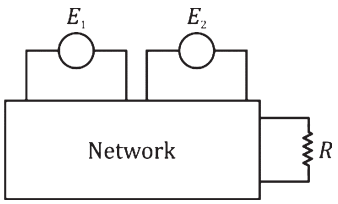
From phasor diagram

$$I = \sqrt{I_R^2 + (I_C - I_L)^2}$$

$$I = \sqrt{3^2 + (5-1)^2} = \sqrt{3^2 + 4^2}$$

$$I = \sqrt{9+16} = 5 \text{ A}$$

10. (*c*)



As we know that power absorb by resistor R is given by

$$P = \frac{V^2}{R}$$

$$\therefore\ \boxed{V = \sqrt{PR}}$$

$\therefore$ When first source is active then voltage across resistor R is

$$V_1 = \sqrt{P_1R} \quad \text{... (i)}$$

When second source is active then voltage across resistor R is

$$V_2 = \sqrt{P_2R} \quad \text{... (ii)}$$

If both source are acting simultaneously. Then net voltage across R is

$$V_{net} = V_1 \pm V_2$$

(depending upon polarity it may be added or subtracted)

$\therefore$ hence power absorb by resistor

$$P = \frac{V_{net}^2}{R} = \frac{(V_1 \pm V_2)^2}{R}$$

$$P = \frac{\left(\sqrt{P_1R} \pm \sqrt{P_2R}\right)^2}{R} = \frac{R\left(\sqrt{P_1} \pm \sqrt{P_2}\right)^2}{R}$$

$$\boxed{P = \left(\sqrt{P_1} \pm \sqrt{P_2}\right)^2}$$

11. (*c*) Force = ma

$= MLT^{-2}$

Work = Force × Displacement

$= ML^2\ T^{-2}$

$$\text{Voltage} = \frac{\text{Work done}}{\text{Charge}}$$

$$V = \frac{ML^2T^{-2}}{IT}$$

$= ML^2T^{-3}I^{-1}$

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}} = ML^2T^{-3}I^{-2}$$

$$\text{Conductance} = \frac{1}{R} = \left[M^{-1}L^{-2}T^3I^2\right]$$

12. (*b*) As we know that power consumed by resistor R

$W = I^2R$

$$W = I^2 \cdot \frac{\rho L}{A} = I^2 \cdot \frac{\rho L}{\frac{\pi D^2}{4}}$$

$$\therefore\ W = \frac{4I^2\rho L}{\pi D^2}$$

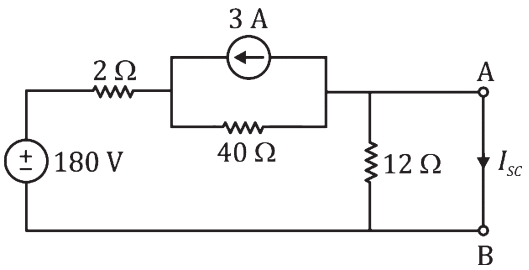
Now as per question new power consumed

$$W' = \frac{4\cdot(3I)^2\cdot\rho\frac{L}{2}}{\pi\cdot(2D)^2} = \frac{4\times 9I^2\cdot\rho L}{\pi\ 2\times 4D^2}$$

$$W' = \frac{9}{8} \cdot W = \frac{9}{8} \times 32$$

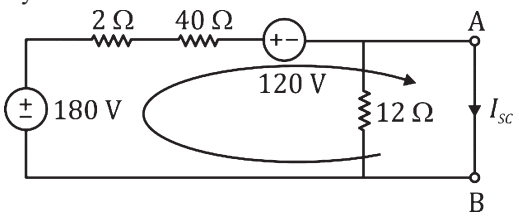
$W' = 36$ W

13. (*a*)



To find Norton's current, short circuit the terminal A and B and find I_{SC}

By source transformation



Apply KVL

$-180 + 42I_{SC} + 120 = 0$

$42I_{SC} = 60$

$$I_{SC} = \frac{60}{42} = \frac{10}{7} = 1.43 \text{ A}$$

14. (*c*) Time constant for a coil

$$T = \frac{L}{R}$$

If no. of turns of the coil is doubled then inductance becomes 4 times because inductance

$$L = \frac{N^2 \mu A}{\ell}$$

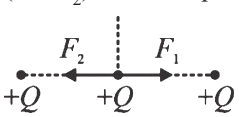
$L \propto N^2$

$\therefore$ Time constant becomes four-fold.

15. (*a*) Depolarizer converts the produced hydrogen into water.

In carbon-zinc cell or Leclanche cell manganese diode (MNO_2) used as depolarizer.

16. (*a*)



$\because$ Force exerted by both the charges on middle are same.

$\therefore$ Third charge i.e. middle charge remains in stable equilibrium condition.

$$\because \ |F_1| = |F_2| = \frac{KQ^2}{(r/2)^2}$$

$\therefore \ F_{net} = 0$

17. (*d*) Zinc-Carbon cell or Leclanche cell is most common dry cell. In this cell manganese di-oxide (MnO_2) is used as a depolarizer which converts hydrogen gas into water.

The depolarizer in Zinc-Carbon cell mainly contains brown iron ore and carbon powder.

18. (*b*) Ohm's law is followed by linear elements only. It is not followed by non-linear elements such as arc lamp, diode, transistor etc. Here copper electrode follows Ohm's law.

19. (*c*) If three conductances G_1, G_2 and G_3 are connected in parallel then equivalent conductance

$G_{eq} = G_1 + G_2 + G_3$

$= 2 + 3 + 6$

$G_{eq} = 11 \ \Omega$

$$\therefore \ R_{eq} = \frac{1}{G_{eq}} = \frac{1}{11} \Omega$$

20. (*b*)

21. (*c*) $R_{50°C} = 5 \ \Omega, \qquad R_{100°C} = 6 \ \Omega$

$\because \ R_t = R_0 (1 + \alpha_0 \Delta T)$

$5 = R_0 (1 + \alpha_0 \, 50)$ …(i)

$6 = R_0 (1 + \alpha_0 \, 100)$ …(ii)

(ii) / (i),

$$\frac{6}{5} = \frac{R_0 (1 + 100 \alpha_0)}{R_0 (1 + 50 \alpha_0)}$$

$$\frac{6}{5} = \frac{(1 + 100 \alpha_0)}{1 + 50 \alpha_0}$$

$6 + 300 \ \alpha_0 = 5 + 500 \ \alpha_0$

$1 = 200 \ \alpha_0$

$$\alpha_0 = \frac{1}{200} / °C$$

Putting value of α_0 in equation (i)

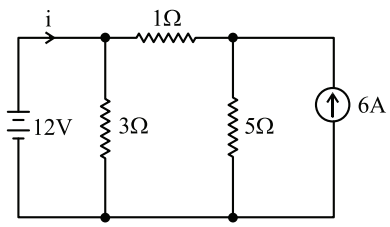
$$5 = R_0 \left(1 + \frac{1}{200} \times 50\right)$$

$$5 = R_0 \left(1 + \frac{1}{4}\right)$$

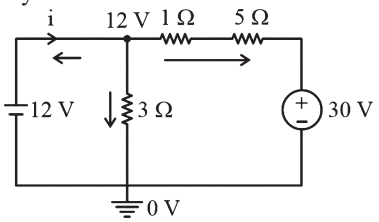
$$5 = R_0 \times \frac{5}{4}$$

$R_0 = 4 \ \Omega$

22. (*a*)



By source transformation.



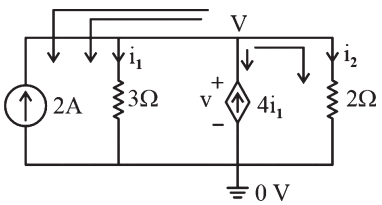
Apply KCL,

$$-i+\frac{12}{3}+\frac{12-30}{6}=0$$

$-i + 4 - 3 = 0$

$i = 1$ A

23. (*c*)



Apply KCL,

$$-2+\frac{V}{3}-4i_1+\frac{V}{2}=0$$

$$-12 + 2V - 24i_1 + 3V = 0$$

$$\because i_1=\frac{V}{3}\Rightarrow V=3i_1$$

$$\therefore -12 + 6i_1 - 24i_1 + 9i_1 = 0$$

$$-9i = 12$$

$$i_1=\frac{-12}{9}=-\frac{4}{3}\text{A}$$

24. (*c*) Given that:

$l = 50$ cm $= 50 \times 10^{-2}$ m

$v = 50$ m/sec

Magnetic flux density = 1 Wb/m^2

$\therefore$ induced EMF

$e = Bvl \sin\theta$

If direction of motion is perpendicular to field

$\therefore \theta = 90°$ $\sin 90° = 1$

$e = Bvl = 1 \times 50 \times 50 \times 10^{-2}$

$e = 25$ Volt

25. (*a*) $\because$ inductive reactance

$X_L = 2\pi fL$

$X_L \propto f$

$$\therefore \frac{X_{L_2}}{X_{L_1}}=\frac{f_2}{f_1}=\frac{60}{50}$$

$$X_{L_2}=\frac{6}{5}\times 60$$

$$X_{L_2}=72\,\Omega$$

❑❑❑