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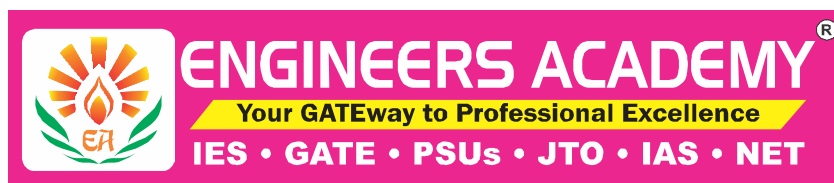
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CONTENTS

S.No.	TOPIC	Page No.
1.	Network Theory	03 – 246
2.	Electrical Machines.....	249 – 462
3.	Power Electronics	465 – 501
4.	Digital Electronics	504 – 551



UNIT-I

NETWORK THEORY

1.	Basics of Circuit and Circuit Law	03 – 74
2.	KVL and KCL	75– 102
3.	Network Theorem	103– 127
4.	AC Circuits and Resonance	128– 188
5.	Transient Response	189–199
6.	Magnetic Coupled Circuits	200– 213
7.	Cell & Battery	214– 218
8.	Miscellaneous	219– 246



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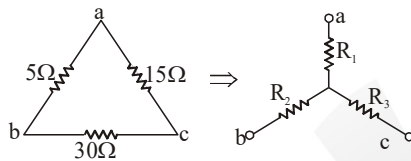
BASICS OF CIRCUIT AND CIRCUIT LAW

CHAPTER

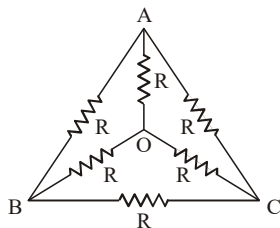
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OBJECTIVE QUESTIONS

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

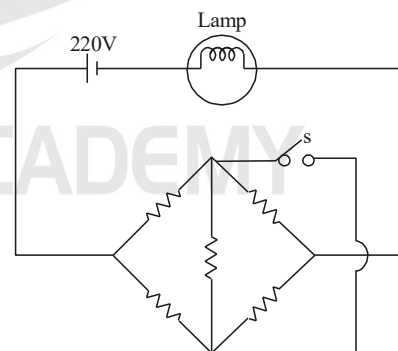
9. Two incandescent light bulbs of 40 W and 60 W rating are connected in series across the mains. Then

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

11. All resistance in the given circuit are at $R \Omega$ 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

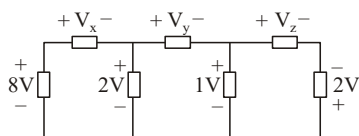
12. If each branch of a delta circuit has impedance $\sqrt{3} Z$, then each branch of equivalent star circuit has impedance would be

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

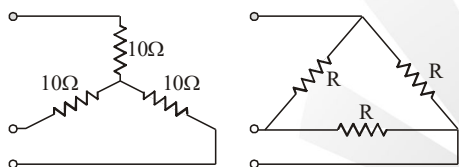
13. The dual of parallel RC circuit is a
 (a) Series RC circuit (b) Series RL circuit
 (c) Parallel RC circuit (d) Parallel RL circuit
14. Two resistances are connected in parallel and each dissipates 40 W. The total power supplied by the source is equals to
 (a) 80 W (b) 40 W (c) 160 W (d) 20 W

[TNPSC AE - 2018]

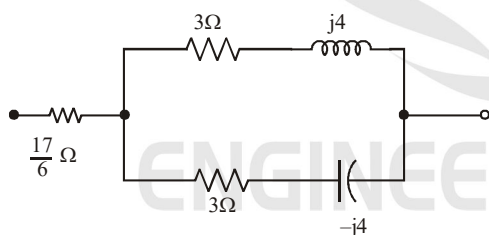
15. The value of V_x , V_y and V_z in figure shown are



- (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

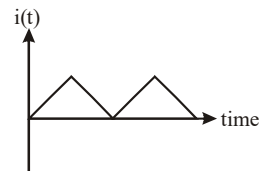


- (a) $(7 + j0)$ (b) $(5 + j0)$ (c) $(0 + j8)$ (d) $(7 + j10)$
19. **Assertion (A):** Two wires of same length with different cross sectional areas are connected in series. The heat produced by the current is more in the thicker wire.
Reason (R): The thicker wire has low resistance.
- (a) Both A and 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.

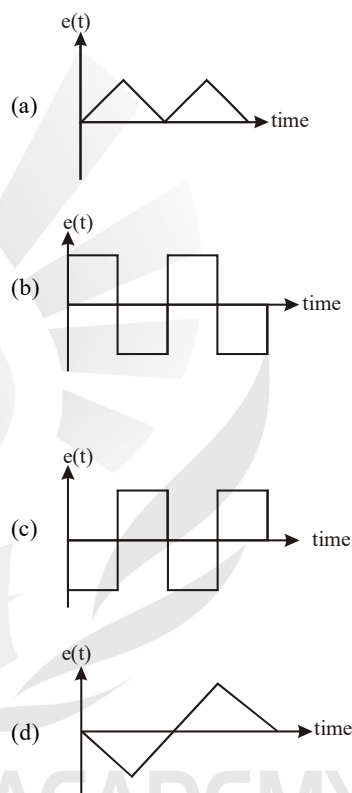
20. What is the power absorbed by a 3-phase load?

- (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.



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 $\frac{1}{2}$

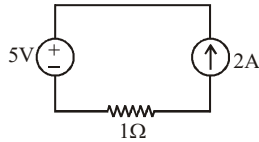
23. A cylindrical block of certain material has a resistance R as measured between its circular faces. To half the resistance, all the dimensions of the block must be

- (a) Doubled (b) Halved
 (c) Decreased by $\sqrt{2\pi}$ (d) Increased by $\sqrt{2\pi}$

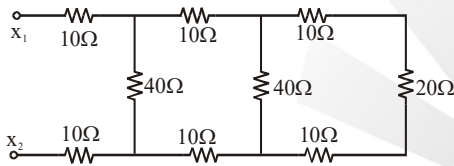
24. The time rate of change of a current passed through a 1mH inductor is 2 mA/s. This means that the voltage across the inductor is.

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

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

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

90. A current is said to be alternating when it changes in

- (a) Magnitude only
- (b) Direction only
- (c) Both magnitude and direction
- (d) None

91. Which of the following material has least specific Resistance

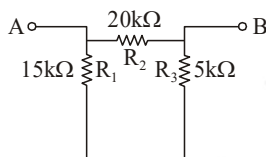
- (a) Copper
- (b) Silver
- (c) Aluminum
- (d) Iron

92. Resistivity of a wire depends upon

- (a) Material
- (b) Area
- (c) Length
- (d) All of these

[UPPCL JE - 2007]

93. In the following figure, the resistance measured across A and B will be



- (a) 5 kΩ
- (b) 10 kΩ
- (c) 15kΩ
- (d) 20 kΩ

[UPPCL JE - 2007]

94. A charge of 0.1 coulomb moves through a given point in every 0.05 seconds. The current flowing through the point is

- (a) 2 mA
- (b) 5 mA
- (c) 2 A
- (d) 5 A

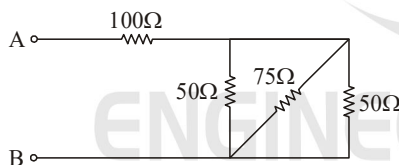
[UPPCL JE - 2007]

95. A 220 V, 200 W bulb and a 220 V, 100 W bulb are connected in series across a 220 V supply, the power consumed by them will be

- (a) 33.3 W
- (b) 66.6 W
- (c) 100 W
- (d) 300 W

[UPPCL JE - 2007]

96. In the following figure, the equivalent resistance at terminals A and B will be



- (a) 275 Ω
- (b) 180 Ω
- (c) 118.75 Ω
- (d) None of these

[UPPCL JE - 2007]

97. A 2.2 m long conductor has a cross sectional area of 0.025 m² and resistance of 5 ohms, find its resistivity.

- (a) 0.072 ohm m
- (b) 0.057 ohm m
- (c) 0.58 ohm m
- (d) 0.67 ohm m

[UPPCL JE - 2016]

98. Power dissipated in a pure capacitor is

- (a) Equals to I^2R
- (b) Minimum
- (c) Zero
- (d) Equals to heat loss

[UPPCL AE - 2016]

99. What will be the largest number of 100 W electric light bulbs which can be operated from a 200V supply fitted with a 13A fuse?

- (a) 16
- (b) 26
- (c) 31
- (d) 32

[UPPCL AE - 2016]

100. _____ is the property of conductor which is opposite to the property that opposes flow of current.

- (a) Conductance
- (b) Resistance
- (c) Reluctance
- (d) Inductance

[UPPCL AE - 2016]

101. If the diameter D of a conductor is doubled, its resistance R will be reduced to

- (a) 1/4 R
- (b) 16 R
- (c) 1/16 R
- (d) No change

[UPPCL AE - 2016]

102. A nickel coil has a resistance of 16Ω at 50°C. If the temperature coefficient of resistance at 0°C is 0.003/°C, the resistance at 0°C is: (approx)

- (a) 16.9 Ω
- (b) 14 Ω
- (c) 23.3 Ω
- (d) 15.5 Ω

[UPPCL AE - 2016]

103. One coulomb-per-second is equal to one ____.

- (a) Watt
- (b) Joule
- (c) Volt
- (d) Ampere

[UPPCL AE - 2016]

104. The capacitance of a variable air capacitor is maximum when

- (a) The movable plates half overlap the fixed plates
- (b) The movable plates are most widely separated from the fixed plates
- (c) Both sets of plates are exactly meshed.
- (d) The movable plates are closer to one side of the fixed plate than to the other.

[UPPCL AE - 2016]

105. Electrical voltage is also known as :

- (a) Electric pressure
- (b) Energy
- (c) Watt
- (d) Unit

[UPPCL AE - 2016]

106. The length of wire having resistance of 1 ohm/m in a heater rated at 1000 W and 250 V will be

- (a) 62.8 mm
- (b) 26.5 m
- (c) 62.5 m
- (d) 1.5 m

[UPPCL AE - 2016]

107. Calculate the resistance of 1 km long copper wire of radius 1 mm. (If resistivity of copper = 1.72×10^{-8})

- (a) 5.5 Ω
- (b) 6.5 Ω
- (c) 4.5 Ω
- (d) 6.75 Ω

[UPPCL AE - 2016]

108. How is the voltage determined when the current and resistance are given?

- (a) Divide the current by the resistance
- (b) Subtract the current from the resistance
- (c) Multiply the current and resistance
- (d) Add the current and the resistance

[UPPCL JE - 2018]

109. Here are two threads B and C have the same cross-section and are made of the same material. $R_b = 500 \Omega$ and $R_c = 100 \Omega$. The number of times B is longer than C is _____.
 (a) 1 (b) 5 (c) 4 (d) 3
[UPPCL JE - 2018]
110. The number of nodal equation in the nodal analysis of a linear circuit having 4 nodes will be
 (a) 6 (b) 5 (c) 3 (d) 4
[UPPCL JE - 2018]
111. What is the total resistance of a series circuit and parallel circuit respectively for resistors $R_1 = 2 \text{ ohms}$, $R_2 = 4 \text{ ohms}$ and $R_3 = 1 \text{ ohm}$?
 (a) 1.75, 7 (b) 7, 1.5 (c) 7, 0.571 (d) 7, 7
[UPPCL JE - 2018]
112. The average power consumed in purely inductive circuit is:-
 (a) 0.25 (b) 0 (c) 0.5 (d) 1
[UPPCL JE - 2018]
113. Find the odd one out regarding Ohm's Law.
 (a) Vacuum tubes (b) Conductor
 (c) DC circuit (d) High Voltage Circuit
[UPPCL JE - 2018]
114. In DC circuit, which of the following components is used to reduce the voltage?
 (a) Resistor (b) Inductor (c) Reactor (d) Capacitor
[UPPCL JE - 2018]
115. The law of electromagnetic induction is also called
 (a) Joule's law (b) Faraday's law
 (c) Coulomb's law (d) Ohm's law
[UPPCL JE - 2018]
116. Which of the following correctly defines Power?
 (a) Energy
 (b) kWh
 (c) The rate at which energy is used
 (d) The rate at which energy is generated
[UPPCL JE - 2018]
117. What is the SI unit of conductivity?
 (a) $\Omega^{-1}\text{m}$ (b) $\Omega^{-1}\text{m}^{-1}$ (c) Ω (d) Ωm
[UPPCL JE - 2018]
118. The property of a substance which oppose the flow of current is known as
 (a) Conductance (b) Reluctance
 (c) Resistance (d) Admittance
[DSSSB JE - 2014]
119. Three equal resistances when combined in series total power loss is 90 W. Their power loss when combined in parallel will be
 (a) 270 W (b) 30 W (c) 810 W (d) 10 W
[DSSSB JE - 2014]
120. The property of a conductor due to which it passes current is called
 (a) Resistance (b) Reluctance
 (c) Conductance (d) Inductance
[DSSSB JE - 2015]
121. The resistance of a conductor varies inversely as
 (a) Length (b) Area of cross-section
 (c) Temperature (d) Resistivity
[DSSSB JE - 2015]
122. With rise in temperature the resistance of pure metals
 (a) Increases
 (b) Decreases
 (c) First increases and then decreases
 (d) Remains constant
[DSSSB JE - 2015]
123. Three resistances of 10 Ohms, 15 Ohms and 30 Ohms are connected in parallel. The total resistance of the combination is
 (a) 5 ohms (b) 10 ohms (c) 15 ohms (d) 55 ohms
[DSSSB JE - 2015]
124. In a circuit a 33 Ohm resistor carries a current of 2A. The voltage across the resistor is
 (a) 33 V (b) 66 V (c) 80 V (d) 132 V
[DSSSB JE - 2015]
125. A light bulb draws 300 mA when the voltage across it is 240 V. The resistance of the light bulb is
 (a) 400 Ohms (b) 600 Ohms
 (c) 800 Ohms (d) 1000 Ohms
[DSSSB JE - 2015]
126. Two resistors are not said to be connected in series when
 (a) Same current passes in turn through both
 (b) Both carry the same value of current
 (c) Total current equals the sum of branch currents
 (d) Sum of IR drops equals the applied e.m.f.
[DSSSB JE - 2015]
127. Which of the following statements is true both for a series and a parallel D.C. circuit?
 (a) Elements have individual currents
 (b) Currents are additive
 (c) Voltages are additive
 (d) Powers are additive
[DSSSB JE - 2015]
128. If the energy is supplied from a source, whose resistance is 1 Ohm, to a load of 100 Ohms the source will be
 (a) A voltage source (b) A current source
 (c) Both of above (d) None of the above
[DSSSB JE - 2015]

129. The circuit whose properties are same in either direction is known as

- (a) Unilateral circuit (b) Bilateral circuit
(c) Irreversible circuit (d) Reversible circuit

[DSSSB JE - 2015]

130. The number of independent equations to solve a network is equal to

- (a) The number of chords
(b) The number of branches
(c) Sum of the number of branches and chords
(d) Sum of number of branches, chords and nodes

[DSSSB JE - 2015]

131. Siemens is a unit for measuring

- (a) Resistance (b) Flux density
(c) Conductance (d) Electric field

[TNPSC AE - 2018]

132. "The mass of an ion liberated at an electrode is directly proportional to the quantity of electricity".

The above statement is associated with

- (a) Newton's law
(b) Faraday's law of electromagnetics
(c) Faraday's law of electrolysis
(d) Gauss's law

[TNPSC AE - 2018]

133. What is the equivalent resistance of one limb A when delta connection is transformed into star?

- (a) $R_1 R_3 / R_1 + R_2 + R_3$ (b) $R_2 R_3 / R_1 - R_2 + R_3$
(c) $R_1 R_2 R_3 / R_1 + R_2 + R_3$ (d) $R_1 + R_2 + R_3$

[Jammu & Kashmir JE - 2016]

134. A linear circuit contains ideal resistors and ideal voltage source. If values of all the resistors are halved then voltage across each resistor becomes.

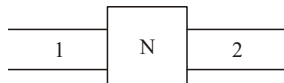
- (a) Halved (b) Doubled
(c) Remained unchanged (d) Decreased by 4 times

[UPRVUNL JE - 2016]

135. In two-port network N has the transmission parameter

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix}. \text{ The open circuit input impedance of the network}$$

at port-1 will be-



- (a) AD/BC (b) D/C (c) AB/DC (d) A/C

[Coal India Ltd. - 2017]

136. For a two port network to be reciprocal :

- (a) $Z_{11} = Z_{22}$ (b) $Y_{12} = Y_{21}$
(c) $H_{21} = H_{12}$ (d) $AD - BC = 0$

[Jammu & Kashmir JE - 2016]

137. Select the correct statement from the following

- (a) An electrical network and electrical circuit are same
(b) An electrical network has no relation to electrical circuit
(c) An electrical circuit should have at least one closed loop
(d) An electrical circuit need not have any closed loop

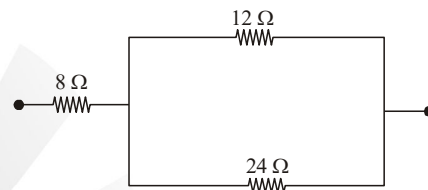
[UPRVUNL - 2014]

138. The laws used in tie set and cut set of a network are -

- (a) Ohms law (b) Kirchhoff's laws
(c) Biot Savart's law (d) Lorentz's law

[UPRVUNL AE - 2014]

139. The equivalent resistance of a series parallel circuit shown in the figure is :



- (a) 8 ohms (b) 10 ohms (c) 12 ohms (d) 16 ohms

[ESIC JE - 2016]

140. A star circuit has Each branch resistance of $R/2$. The equivalent delta each branch resistance will be :

- (a) $R/6$ (b) $3R/2$ (c) $2R$ (d) $4R$

[ESIC JE - 2016]

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

- (a) 4 loop equation (b) 7 loop equation
(c) 10 loop equations (d) 5 loop equations

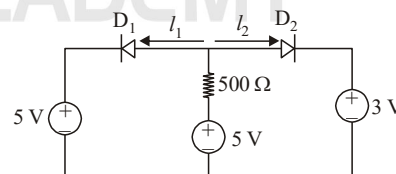
[FCI - 2015]

142. In terms of ABCD parameters, a two port network is symmetrical if and only if

- (a) $A = B$ (b) $B = C$ (c) $C = D$ (d) $D = A$

[Uttarakhand AE - 2013]

143. In the circuit shown below, D_1 and D_2 are ideal diodes. The current I_1 and I_2 are :



- (a) Zero, 4 mA (b) 4 mA, Zero
(c) Zero, 8 mA (d) 8 mA, Zero

[UPRVUNL AE - 2016]

144. Network which contain one or more than one source of emf is known as

- (a) Active Network (b) Passive Network
(c) Electric network (d) None of these

[BSNL TTA - 2016]

379. The capacitance of a parallel plate capacitor is not affected by :

- (a) Thickness of conduction plates
- (b) Area of the conducting plates
- (c) Distance separating the plates
- (d) Nature of the dielectric between the plates

[BSNL TTA - 2016]

380. Which of the following is a passive component?

- (a) Semiconductor devices
- (b) Vacuum tube devices
- (c) Capacitors
- (d) All of these

[BSNL TTA - 2017]

381. The electrical capacitance is analogous of

- (a) Fluid flow
- (b) Thermal resistance
- (c) Inertia
- (d) Spring

[BSNL TTA - 2017]

382. A capacitor is charged by constant current of 2 mA and results in a voltage increase of 12V at 10 sec interval. The value of capacitance is

- (a) 0.75 milli Farad
- (b) 24 milli Farad
- (c) 12 milli Farad
- (d) 1.67 milli Farad

[BSNL TTA - 2016, UPRVUNL - 2016]

383. Two capacitors of $2\ \mu\text{F}$ and $3\ \mu\text{F}$ are connected in series across 10V. The potential difference across the $2\ \mu\text{F}$ capacitor will be :

- (a) 4 V
- (b) 6 V
- (c) 10 V
- (d) 0 V

[BSNL TTA - 2016]

384. A battery of 40 V and three capacitor of 1000 mF, 500 mF, and 100 mF are all connected in (I) parallel and (II) series. The ratio of total charge stored in case (I) that in case (II) is approximately

- (a) 3 : 64
- (b) 64 : 3
- (c) 160 : 3
- (d) 104 : 5

385. A capacitor capable of storing 1 J of energy at 100 V DC supply. The value of capacitance will be ?

- (a) 100 μF
- (b) 200 μF
- (c) 50 μF
- (d) 400 μF

[BSNL TTA (JE) - 2013]

386. An air-filled parallel plate capacitor made of square plates, each $10\text{ cm} \times 10\text{ cm}$, has a capacitance C. If the plates are reduced to $2.5\text{ cm} \times 2.5\text{ cm}$, what would be the new capacitance ?

- (a) C/4
- (b) C/8
- (c) C/16
- (d) C/32

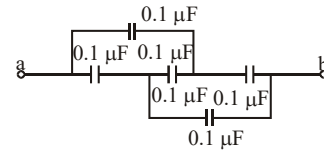
[BSNL TTA (JE) - 2013]

387. A coil would behave as

- (a) An inductor at high frequencies
- (b) A capacitor at very low frequencies
- (c) A resistor at high frequencies
- (d) A capacitor at very high frequencies

[BSNL TTA (JE) - 2013]

388. The equivalent capacitance between a and b will be



- (a) $0.2\ \mu\text{F}$
- (b) $0.1\ \mu\text{F}$
- (c) $0.5\ \mu\text{F}$
- (d) 0

389. Power factor of a circuit can be improved by the use of :

- (a) Choke coil
- (b) Capacitor
- (c) Induction motor
- (d) None of these

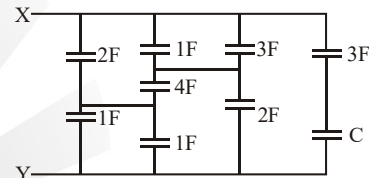
[BSNL TTA - 2016]

390. A circuit component that opposes the change in circuit voltage is

- (a) Resistance
- (b) Capacitance
- (c) Inductance
- (d) All of these

[SSC-JE - 2008, BSNL TTA - 2016]

391. What is the value of C such that equivalent capacitance across X-Y is 5F ?



- (a) 20 F
- (b) 23 F
- (c) 22 F
- (d) 21 F

392. Capacitors with solid dielectric materials is use because_____.

- (a) they give a reduced dielectric low
- (b) they are smaller in size as compared with air capacitors
- (c) they have a lower capacitance value is with air capacitors
- (d) none of these

[BSNL TTA - 2016]

393. A trimmer is basically, a_____.

- (a) Insulator
- (b) Inductor
- (c) Capacitor
- (d) Variable resistor

[BSNL TA - 2016]

394. Capacitance, Voltage and Charge are related as

- (a) $Q = CV$
- (b) $C = QV$
- (c) $V = QC$
- (d) None

[BSNL TTA - 2016]

395. If four 80 micro farad capacitors are connected in series, the net capacitance is.....

- (a) 20 μF
- (b) 40 μF
- (c) 160 μF
- (d) 320 μF

[BSNL TTA - 2016]

396. The energy required to charge a 10 F capacitor to 100 V is

- (a) 0.10 J
- (b) $5 \times 10^4\text{ J}$
- (c) $5 \times 10^{-9}\text{ J}$
- (d) $10 \times 10^{-9}\text{ J}$

[BSNL TTA - 2016]

397. Capacitance of a capacitor

- (a) Increases with increases in overlapping area of plates
- (b) Increases with increases in relative permittivity of the dielectric
- (c) Increases with decreases in distance between the plates
- (d) All of the above

[BSNL TTA - 2016]

398. Two capacitors of 2 F each are connected in series to a 1V battery. The total charge supplied by the battery to capacitors is

- (a) 1 C (b) 2 C (c) 0.5 C (d) 0.25 C

[BSNL TTA (JE) - 2015]

399. Farad is a unit of

- (a) inductance (b) voltage
(c) electric current (d) capacitance

[BSNL TTA - 2016]

400. Capacitors used for improvement of power factor of a system because capacitor

- (a) Draws lagging power and supply leading power
(b) Draws lagging power and supply lagging power
(c) Draws leading power and supply lagging power
(d) Draws leading power and supply leading power

[UPPCL (AE) - 2015]

401. The unit of dielectric strength is given by

- (a) V/m (b) V²/m (c) m/V (d) m/V²

[UPSSC-JE - 2016]

402. A capacitor stores energy in.....

- (a) Electric field (b) Electromagnetic
(c) Magnetic field (d) Dielectric dipole

[UPRVUNL - 2015, Jharkhand JE - 2017]

403. Power factor in an industry can be improved by:

- (a) Transformer (b) Capacitor
(c) Inductor (d) Stabilizer

[DMRC - 2015]

404. The power factor of a pure capacitive circuit is:

- (a) maximum (b) unity
(c) 0.8 leading (d) Zero

[DMRC - 2015]

405. A circuit requires a capacitor of 100 μ F, 25V. The capacitor can be :

- (a) Paper capacitor (b) Electrolytic capacitor
(c) Ceramic capacitor (d) Any type of capacitor

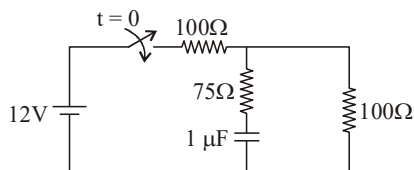
[DMRC - 2014]

406. The total capacitance of two 40 μ F series connected capacitors in parallel with a 4 μ F capacitor is :

- (a) 3.8 μ F (b) 5 μ F (c) 24 μ F (d) 44 μ F

[RPHE - 2015]

407. The capacitor voltage in the circuit after long time ($t = 0$) the switch has been closed is :



- (a) 5.1 V (b) 0 V (c) 12 V (d) 6 V

[M.P.J.E - 2015]

408. What is the appropriate dielectric strength in (volts/mm) of gutta-percha ?

- (a) 10,000–25,000 (b) 10,000–20,000
(c) 10,000–40,000 (d) 10,000–35,000

[MPJE - 2016]

409. With a fixed value capacitor C and variable voltage V across it, the energy stored in the capacitor is.

- (a) CV^2 (b) $0.5CV^2$ (c) $2CV^2$ (d) CV

410. In capacitor circuit, the current leads the voltage by an angle ϕ the loss angle of the same capacitor will be

- (a) ϕ (b) $(90 - \phi)$
(c) $(90 + \phi)$ (d) RLC circuit

[I.O.F. - 2014]

411. The essential condition for the Paschen's law to be valid is that

- (a) Voltage must be D.C.
(b) Voltage must be A.C.
(c) Temperature must be constant
(d) Humidity must be low

[I.O.F. - 2014]

412. When two capacitors are connected in series, their total value of capacitance –

- (a) Remains same (b) Reduces
(c) Increases (d) None of these

[UPSSC - 2015]

413. A bank of condenser across the load is used

- (a) For improving the power factor
(b) For decreasing the power factor
(c) For progress in the fluctuations
(d) For quick start of the motors

[MPJE - 2016]

414. Two capacitors C_1 and C_2 have $C_1=20\mu$ F and $C_2=30\mu$ F, are connected in parallel across a 100V source. The net capacitance of the circuit is?

- (a) 50 μ F (b) 10 μ F (c) 12 μ F (d) 60 μ F

[DMRC JE - 2016]

415. Which of the following capacitors are used in D.C. circuits ?

- (a) Mica (b) Air
(c) Ceramic (d) Electrolytic

[Uttarakhand JE-I - 2013]

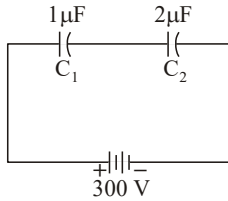
416. Which of the following types best describes rate of charge of a capacitor?

- (a) Linear (b) Quadratic
(c) Exponential (d) None of these

417. What is the SI unit for capacitance?

- (a) Volt (b) Watt (c) Farad (d) None

418. In the following figure, the voltage across C_1 will be



- (a) 100 V (b) 200 V (c) 150 V (d) 300 V

[UPPCL JE - 2007]

419. If three $15 \mu\text{F}$ capacitors are connected in series, the net capacitance is

- (a) $5 \mu\text{F}$ (b) $40 \mu\text{F}$ (c) $50 \mu\text{F}$ (d) $30 \mu\text{F}$

[UPSSC JE - 2016]

420. A $1 \mu\text{F}$ capacitor is connected to 12 V battery. The energy stored in the capacitor is .

- (a) $12 \times 10^{-6} \text{ J}$ (b) $24 \times 10^{-6} \text{ J}$
(c) $48 \times 10^{-6} \text{ J}$ (d) $72 \times 10^{-6} \text{ J}$

[DMRC - 2016]

421. Sparking occurs when a load is switched off because the circuit has

- (a) High capacitance (b) High impedance
(c) High inductance (d) High resistance

[IOF - 2014]

422. If distance between two plates of a parallel plate capacitor is half, the capacitance :

- (a) Doubles (b) Quintuples
(c) Is halved (d) Remains the same

[UPPCL (AE) Re-Exam - 2016]

423. Potential applied across a 2 F capacitor is 10 V. Energy stored will be :

- (a) 200 J (b) 100 J (c) 20 J (d) 10 J

[UPPCL (AE) Re-Exam - 2016]

424. A capacitor C at time $t = 0^+$ with initial charge Q_0 acts as

- (a) Short circuit (b) Open circuit
(c) Current source (d) Voltage source

[APSPDCL - 2012]

425. When the total charge in a capacitor is doubled, the energy stored

- (a) Remains the same (b) Is halved
(c) Is doubled (d) Is quintupled

[APSPDCL-2014]

426. When the plate area of a parallel plate capacitor is increased, keeping the capacitor voltage constant, the force between the plates.....

- (a) Increases (b) Decreases
(c) Remains constant (d) Becomes zero

[UPRVUNL (AE) - 2016]

427. The current through a capacitor is given by :

- (a) $i = C dv/dt$ (b) $i = 1/C dv/dt$
(c) $i = C d^2v/dt^2$ (d) $i = 1/C d^2v/dt^2$

[UPPL (JE) - 2016]

428. Which of the following materials has the maximum dielectric strength ?

- (a) Porcelain (b) Glass
(c) Polystyrene (d) Soft rubber

[UPPCL (AE) - 2015]

429. The reactance of capacitors increases, when :

- (a) Applied voltage increases
(b) AC frequency increases
(c) Applied voltage decreases
(d) AC frequency decreases

[RRB SSE (Shift-II) - 2015, SAIL - 2014]

430. An isolated sphere of radius 1 cm kept in air. Its capacitance will be :

- (a) 2.2 pF (b) 1.11 pF (c) 1.8 pF (d) 2.1 pF

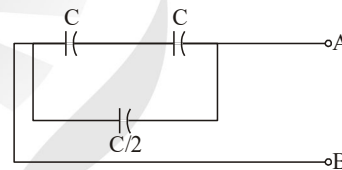
[UPPCL (AE) Re-Exam - 2016]

431. If a capacitance is charged by a square wave current source, then the voltage across the capacitor will be

- (a) Square wave (b) Step function
(c) Triangular wave (d) Zero

[UPPCL JE - 2007]

432. In the following circuit, the equivalent capacitance between terminals A and B is



- (a) $\frac{C}{2}$ (b) $\frac{2}{3}C$ (c) C (d) $3C$

[UPPCL JE - 2007]

433. The energy stored in a $10\mu\text{F}$ capacitor when charged to 500V is _____.

- (a) 1.25 J (b) 5 mJ (c) 50 J (d) 2.5 mJ

[UPPCL AE - 2016]

434. The potential difference across a $20 \mu\text{F}$ capacitor to charge it with 100 mC is

- (a) 10 V (b) 10 kV (c) 5 V (d) 5 kV

[UPPCL AE - 2016]

435. The charge on a 20 pF capacitor when the 20 kV voltage applied to it, is

- (a) $400 \mu\text{C}$ (b) 0.4 C (c) $0.4 \mu\text{C}$ (d) $0.04 \mu\text{C}$

[UPPCL AE - 2016]

436. Four $4\mu\text{F}$ capacitors are connected in series. The equivalent capacitance is

- (a) $8 \mu\text{F}$ (b) $1 \mu\text{F}$ (c) $2 \mu\text{F}$ (d) $16 \mu\text{F}$

[UPPCL AE - 2016]

437. Which of the following statements is correct about capacitors?

- (a) The capacitor open circuit in direct current (DC) circuits and short circuit in alternating current (AC) circuits
- (b) The capacitor short circuit in direct current (DC) circuits and open circuit in alternating current (AC) circuits
- (c) The capacitor disconnects short circuit in both direct current (DC) and alternating current (AC) circuits
- (d) None of these

[UPPCL JE - 2018]

438. The current flowing in a capacitor is called

- (a) Conduction current
- (b) Linear current
- (c) Displacement current
- (d) Constant current

[TNPSC AE - 2018]

439. In a sample and hold circuit, the voltage across the capacitor changes by.... During hold time.

- (a) 50%
- (b) 25%
- (c) 100%
- (d) 150%

[UPRVNL - 2014 AE]

440. Which of the following can be used to increase the capacitance of a capacitor?

- (a) Decrease the plate area
- (b) Increase the plate area
- (c) Increase the magnetic field
- (d) None of these.

441. Which of the following type of material is used between the plates of a capacitor?

- (a) Insulation material
- (b) Conductive material
- (c) Dielectric material
- (d) All the above

442. Which of the following is true for 3.9 k resistor using color-coding technique?

- (a) Red, white, red, gold
- (b) Red, green, orange, silver
- (c) Orange, green, orange, silver
- (d) orange, white, red, gold

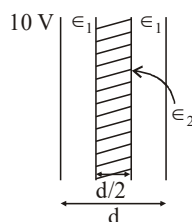
[UPPCL JE - 2018]

443. Which of the following is the correct formula of specific resistance?

- (a) R/L
- (b) RL/A
- (c) RA/L
- (d) A/RL

[UPPCL JE - 2018]

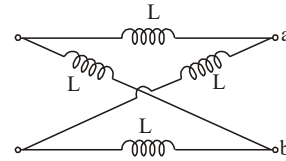
444. A parallel plate capacitor with two dielectric material is shown in the figure. If the potential difference between one of the plate and nearest surface of dielectric is 2V, then the ratio of $\epsilon_1 : \epsilon_2$ is



- (a) 1 : 4
- (b) 2 : 3
- (c) 3 : 2
- (d) 4 : 1

[TNPSC AE - 2018]

445. The network shown in the figure draw a current I . If the ends a and b are shorted, the current drawn would be



- (a) $6I$
- (b) $4I$
- (c) $2I$
- (d) I

446. A Standard resistor is made bifilar type to eliminate :

- (a) Skin effect
- (b) Inductive effect
- (c) Temperature effect
- (d) Stray capacitance

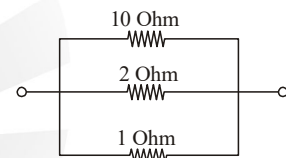
[FCI - 2015]

447. A voltage waveform $V(t) = 12t^2$ is applied across 1 H inductor for $t \geq 0$, with initial current through it being zero. The current through inductor for $t \geq 0$ will be –

- (a) $4t^3$
- (b) $12t^3$
- (c) $24t$
- (d) $12t$

[Uttarakhand AE - 2013]

448. The total conductance of the circuit given below



- (a) 13
- (b) 1.6
- (c) 6
- (d) 2.5

[BSNL TTA (JE) - 2016]

449. Which is known as electrical inertia

- (a) R
- (b) L
- (c) C
- (d) None

[UPSSC-JE - 2016]

450. Electrical appliances are not connected in series, because :

- (a) Power loss is more
- (b) Series circuit is complicated
- (c) Appliances have different current rating
- (d) None of these

[PSPCL JE - 2013]

451. Two bulbs of 500 W and 200 W rated at 250 V will have resistance ratio as-

- (a) 2 : 3
- (b) 2 : 5
- (c) 3 : 2
- (d) 5 : 2

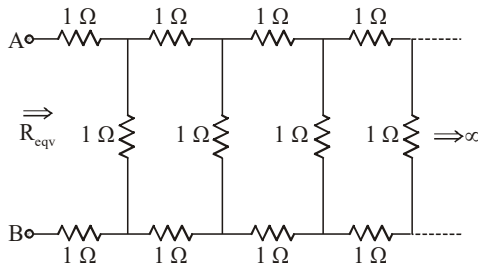
[RRB JE - 01.09.2019]

452. In a four branch parallel circuit, 50 mA current flows in each branch. If one of the branches opens, the current in other branches

- (a) Increase, but not double
- (b) Decrease
- (c) Unaffected
- (d) Double

[ISRO - 2013]

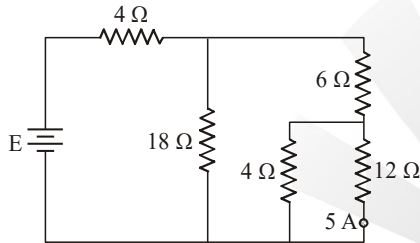
453. Find R_{eqv} across the terminals A and B.



- (a) $(1 + \sqrt{2}) \Omega$ (b) $(1 + 2\sqrt{2}) \Omega$
(c) $(1 + \sqrt{3}) \Omega$ (d) $(1 + 2\sqrt{3}) \Omega$

[ISRO - 2018]

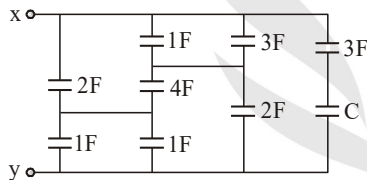
454. In the network shown in the figure below, the current in the 12 Ohm resistor is 5 Amps, the battery voltage E is



- (a) 120 Volts (b) 180 Volts
(c) 300 Volts (d) 310 Volts

[ISRO S/E - 2015]

455. What is the value of C such that equivalent capacitance across x-y is 5F



- (a) 20 F (b) 23 F (c) 22 F (d) 21 F

[ISRO - 2011]

456. An oven take 16 A at 220 V. It is desired to reduce the current to 12 A. The value of resistance which must be connected in series will be

- (a) 4.58 Ω (b) 6.2 Ω (c) 7.1 Ω (d) 10 Ω

[HPSSSB JE - 2017]

457. A copper wire is stretched so that its length is increased by 0.1 percent. The percentage change in its resistance is

- (a) 0.2 percent (b) 0.4 percent
(c) 0.6 percent (d) 0.8 percent

[HPSSSB JE - 2017]

458. An electric fan and a heater are marked 100 W, 200 V and 1000 W, 220 V respectively. The resistance of heater is :

- (a) Zero (b) Greater than that of fan
(c) Less than that of fan (d) Equal to that of fan

[HPSSSB JE - 2017]

459. In a conductor at any section____electrons will be passing in every second, if the current through the conductor is 5 A.

- (a) 6.25×10^{18} (b) 31.35×10^{19}
(c) 31.35×10^{18} (d) 31.35×10^{17}

[DMRC JE - 2020]

460. An energy source forces a constant current of 2 A for 10 s to flow through a lightbulb. If 2.3 kJ is given off in the form of light and heat energy. Calculate the voltage drop across the bulb.

- (a) 230 V (b) 260 V (c) 130 V (d) 115 V

[DMRC JE - 2020]

461. Which of the following type of resistors has highest value of temperature coefficient?

- (a) Metal film (b) Wire wound
(c) Carbon composition (d) Carbon film

[DMRC JE - 2020]

462. Two light bulbs are connected in series across a 120 V battery. Bulb 1 uses 40 W of power and Bulb 2 uses 20 W of power. If bulb 1 alone is connected to the 120 V source, then it will consume

- (a) 90 W (b) 80 W (c) 60 W (d) 180 W

463. The smallest resistance obtained by connecting 50 resistances

of $\frac{1}{4}$ ohm each is

- (a) $\frac{50}{4} \Omega$ (b) $\frac{4}{50} \Omega$ (c) 200 Ω (d) $\frac{1}{200} \Omega$

464. Two electric bulbs rated at P_1 watt, V volt and P_2 watt, V volt are connected in series across V volt. The total power consumed is

- (a) $P_1 + P_2$ (b) $\sqrt{P_1 P_2}$ (c) $\frac{P_1 + P_2}{2}$ (d) $\frac{P_1 P_2}{P_1 + P_2}$

465. An ideal constant current source is connected in series with an ideal voltage source. Considering both together the combination will be a?

- (a) Constant voltage source
(b) Constant current source
(c) Constant power source
(d) None of the above

[ISRO S/E - 2020]

466. Point out WRONG statement. In the node voltage technique of solving networks, choice of a reference node does not :

- (a) Change the voltage across any element
(b) Affect the voltages of various nodes
(c) Affect the operation of the circuit
(d) Alter the potential difference between any pair of nodes

[Coal India-27.02.2020]

467. The resistivity of pure germanium under normal operating conditions is :

- (a) 600 Ω (b) 60 Ω (c) 160 Ω (d) 1000 Ω

[DMRC JE - 2018]

ANSWERS AND EXPLANATIONS1. *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)*

$$L \propto N^2$$

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

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)

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

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

6. *Ans. (c)*

Using Y-Δ conversion

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

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

$$= 40 + 40 = 80 \text{ W}$$

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)*

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

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

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

$$= 3 \times 30 = 90 \text{ W}$$

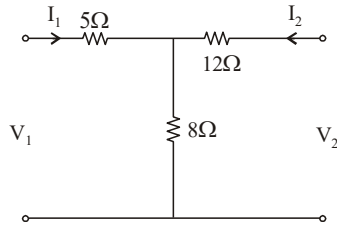
45. *Ans. (c)*

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

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

153. Ans. (b)

154. Ans. (a)

when o/p port $\rightarrow$ open circuit

$$I_2 = 0$$

$$V_1 = Z_{11}I_1 + Z_{12}I_2$$

$$V_2 = Z_{21}I_1 + Z_{22}I_2$$

$$Z_{11} = \frac{V_1}{I_1} = 13$$

$$Z_{21} = \frac{V_2}{I_1} = 8$$

Now:- i/p port $\rightarrow$ open circuit.

$$I_1 = 0$$

$$Z_{12} = \frac{V_1}{I_2} = 8$$

$$Z_{22} = \frac{V_2}{I_2} = 20$$

$$\text{so, Z-parameter} \rightarrow \begin{bmatrix} 13 & 8 \\ 8 & 20 \end{bmatrix}$$

155. Ans. (b)

$$\frac{H_1}{H_2} = \frac{V^2/R_1}{V^2/R_2} \quad \frac{R_2}{R_1} = \frac{2R}{R}$$

$$= 2.1$$

156. Ans. (d)

$$R_1 = 528 \pm 5 \, \Omega = 528 \pm 0.95\%$$

$$R_2 = 325 \pm 3 \, \Omega = 325 \pm 0.92\%$$

True value

$$R_s = R_1 + R_2 = 528 + 325 = 853 \, \Omega$$

$$\% \text{ Error} = \pm \left[\frac{528}{853}(0.95) + \frac{325}{853}(0.92) \right]$$

$$= \pm 0.94 \%$$

 $\therefore$

$$R_s = 853 \pm 0.94\%$$

$$= 853 \pm 8.01 \, \Omega \approx 853 \pm 8 \, \Omega$$

157. Ans. (c)

$$Y\text{-Parameter} = Y_1 + Y_2$$

$$= \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$$

158. Ans. (a)

$$\text{Ideal V.S} \rightarrow R_{\text{internal}} \rightarrow \text{zero}$$

$$\text{Ideal C.S} \rightarrow R_{\text{internal}} \rightarrow \infty$$

159. Ans. (c)

$$R_{\text{eq}} = 10 \parallel 0 = 0$$

160. Ans. (c)

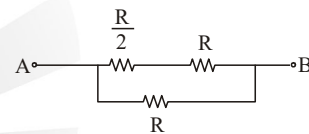
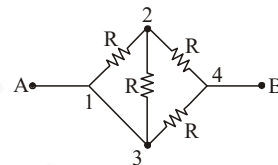
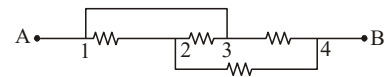
161. Ans. (b)

$$R_{\text{eq}} = 2 \parallel 2 = 1 \, \Omega$$

$$P_T = 2 + 2 = 4 \text{ W}$$

162. Ans. (b)

163. Ans. (a)



$$R_{AB} = \frac{3}{2}R \parallel R$$

$$= \frac{\frac{3}{2}R^2}{\frac{5}{2}R} = \frac{3}{5}R$$

164. Ans. (b)

$$E = P \times t$$

$$(W - h) = \frac{Pt}{1000} (\text{kWh})$$

165. Ans. (d)

166. Ans. (a)

167. Ans. (a)

$$V_{\text{rq}} = IR_1$$

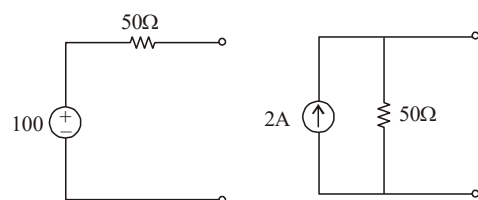
 $\Rightarrow$

$$R_1 = \frac{6}{4} = 1.5 \, \Omega$$

168. Ans. (a)

169. Ans. (d)

170. Ans. (d)



571. *Ans. (c)*

$$10 = \sqrt{V_R^2 + V_L^2}$$

$$10^2 = V_R^2 + V_L^2$$

$$V_L = 8 \text{ V}, V_R^2 = 100 - 64$$

$$V_R = 6 \text{ V}, V_R^2 = 36$$

$$I_R = \frac{V_R}{R} = \frac{6}{1} = 6 \text{ A}$$

572. *Ans. (c)*573. *Ans. (c)*

Voltage across the capacitor

$$V_C(t) = \frac{1}{C} \int_0^t I_C(t) dt$$

Here,

$$I_C(t) = 5u(t)$$

$$V_C(t) = \frac{1}{C} \int_0^t 5u(t) dt$$

$$0 < t < \infty, u(t) = 1$$

$$V_C(t) = \frac{1}{C} \int_0^t 5 dt = \frac{5t}{C}$$

574. *Ans. (d)*575. *Ans. (d)*

For an inductor

$$i(t)|_{t \geq 0} = \frac{1}{L} \int_0^t v(t) dt + i(0)$$

Given,

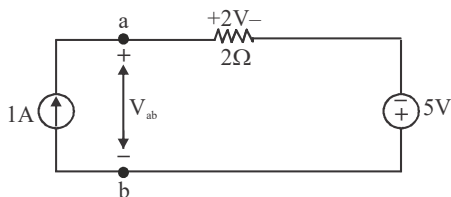
$$v(t) = 12t^2$$

for $t \geq 0$

$$i(0) = 0, \text{ and } L = 1 \text{ H},$$

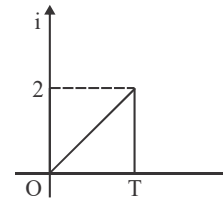
 $i(t)$ for any $t > 0$ is

$$i(t) = \int_0^t 12t^2 dt = 4t^3 \text{ A}$$

576. *Ans. (a)*

The relevant circuit is shown in figure.

$$V_{ab} = 2 - 5 = -3 \text{ V}$$

577. *Ans. (c)*

Current through inductor

$$\text{Voltage} = L \frac{di}{dt} = \text{Rectangular wave}$$

578. *Ans. (b)*

Specific resistance depends on type of material and does not depend on physics dimensions.

579. *Ans. (d)*580. *Ans. (d)*

Magnitude of impedance

$$= \sqrt{R^2 + \omega^2 L^2}$$

$$= \sqrt{(20)^2 + (2\pi f \times 0.056)^2}$$

$$= \sqrt{709.126} = 26.64 \Omega$$

581. *Ans. (a)*

Mutual inductance (M) = 1 H

Inductance $\propto N^2$

$$L_1 \propto \left(\frac{N_1}{2}\right)^2$$

$$L_2 \propto (2N_2)^2$$

$$M \propto \sqrt{L_1 L_2}$$

$$\propto \sqrt{\left(\frac{N_1}{2}\right)^2 (2N_2)^2}$$

$$\propto \sqrt{N_1^2 N_2^2}$$

 $\therefore$ No change.582. *Ans. (c)*583. *Ans. (d)*

$$i_c = C \frac{dv}{dt}$$

$$0 < t < 1$$

$$\frac{dv}{dt} = 10$$

$$i_c = 2 \times 10 = 20 \text{ A}$$

$$1 < t < 3$$

$$\frac{dv}{dt} = -\frac{22}{2} = -11$$

$$i_c = 2 \times -11 = -22 \text{ A}$$

$$3 < t < 5$$

$$\frac{dv}{dt} = \frac{22}{2} = 11$$

$$i_c = 2 \times 11 = 22 \text{ A}$$

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)*

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

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

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

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

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

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

$$= 156.25 \text{ kJ}$$

602. *Ans. (c)*

$$R \propto l$$

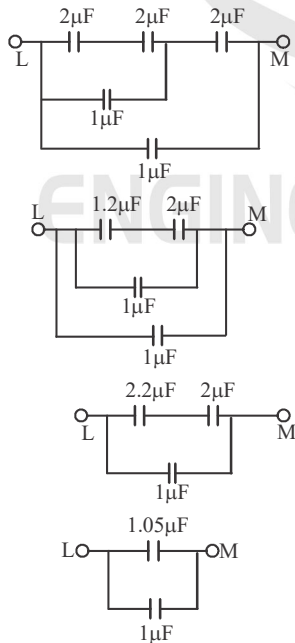
$$\frac{R_A}{R_B} = \frac{l_A}{l_B}$$

 $\Rightarrow$

$$l_A = 8l_B$$

603. *Ans. (c)*

Given circuit is converted to.

 $\Rightarrow$

$$C_{eq} = 2.05 \mu F$$

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,

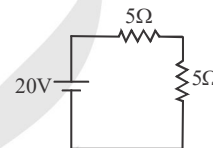
$$V_{th} = 20 \text{ V}$$

$$I_{sc} = 4 \text{ A}$$

$$R_{th} = 5 \Omega$$

Circuit is represented as,

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

607. *Ans. (b)*

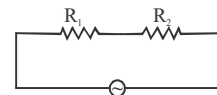
Apply KVL

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

$$-12I + 12 - 24 = 0$$

 $\Rightarrow$

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

608. *Ans. (b)*609. *Ans. (a)*

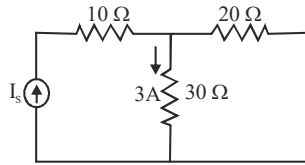
$$R_1 = \frac{(200)^2}{200} = 200 \Omega$$

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

$$R_2 > R_1$$

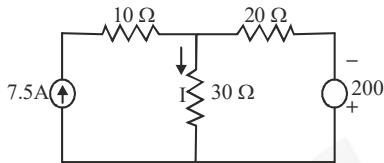
So more voltage across R_2 measured.

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

610. *Ans. (b)*When, $V_s = 0$ circuit becomes.

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

$$\therefore I_s = 7.5 \text{ A}$$

When, $V_s = 200 \text{ V}$ 

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

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

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

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

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.

$$\chi_m = \epsilon_r - 1$$

$$\epsilon_r = \chi_m + 1$$

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

$$P_{\text{avg}} = V_{\text{rms}} I_{\text{rms}}$$

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

618. *Ans. (d)*

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

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

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

$$42 \times 21 = 5R$$

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

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

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

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

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

$$= 0.5 V_m I_m \sin 4\pi f t$$

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).

□□□