SMART EDITION

1
VOLUME

ELECTRICAL ENGINEERING

MCQ

Assistant Engineer & Junior Engineer

Network Theory • Electrical Machine
Power Electronics • Digital Electronics

Complete in-Depth Solutions of All Question | Topic-wise Bifurcation of Questions
Also Useful for State-AE/JE, PSUs and PSCs Exams

ENGINEERS ACADEMY®
Your GATEway to Professional Excellence
IES • GATE • PSUs • JTO • IAS • NET

www.eapublications.org
+ 91-80944 41777

Published by

ENGINEERS ACADEMY®
Your GATEway to Professional Excellence
IES • GATE • PSUs • JTO • IAS • NET

Corporate Office: # 100-102, Ram Nagar, Bambala Puliya, Toll Tax,
Tonk Road, Pratap Nagar, Jaipur (Rajasthan)-302033
E-Mail : engineers.academy.india@gmail.com
Website : www.engineersacademy.org
Helpline Number : +91 8094441777

ISBN : 978-93-93531-24-7

First Edition : 2013
Second Edition : 2014
Third Edition : 2015
Fourth Edition : 2016
Fifth Edition : 2017
Sixth Edition : 2018
Seventh Edition : 2020
Eighth Edition : 2022

Price : ₹1000.00

Preface

This book has been written to meet the growing requirements of candidates appearing for State Engineering Service Examination, Junior Engineer, Public Sector Units, RRB-JE and Metro Exams. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions (MCQ Volume-I) which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in State Engineering Service Examination, Junior Engineer, Public Sector Units, RRB-JE and Metro Exams.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor typos in the book. If any such typos found, they will be highly appreciated and incorporated in the next edition. Also, please provide your valuable suggestions at :engineers.academy.india@gmail.com

All the Best!

Engineers Academy Editorial Board

CONTENTS

UNIT-I

NETWORK THEORY

ENGINEERS ACADEMY®
Your GATEway to Professional Excellence
IES • GATE • PSUs • JTO • IAS • NET

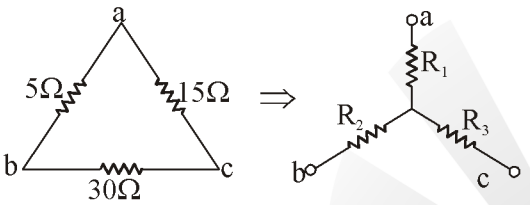
www. eapublications.org

CHAPTER 1

BASICS OF CIRCUIT AND CIRCUIT LAW

OBJECTIVE QUESTIONS

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



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

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

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

(a) Halved

(b) Doubled

(c) Increased by four times

(d) Not changed

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

(a) 1000 turns (b) 2500 turns

(c) 2582 turns (d) 582 turns

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

(a) 3 loop equations

(b) 4 loop equations

(c) 7 loop equations

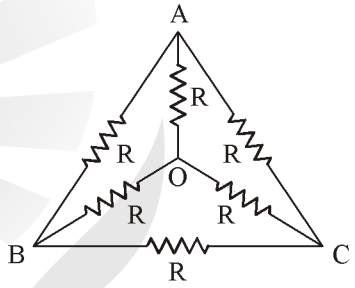
(d) 10 loop equations

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

(a) α (b) 2α

(c) $\frac{1}{\alpha}$ (d) α^2

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



(a) R (b) R–1

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

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

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

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

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

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

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

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

(a) The bulbs together consume 100 W

(b) The bulbs together consume 50 W

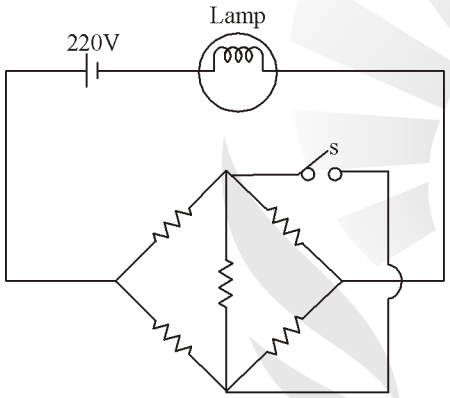
(c) The 60 W bulb glows brighter

(d) The 40 W bulb glows brighter

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

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

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



(a) Increases

(b) Decreases

(c) Remains the same

(d) Depends on the value of R

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

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

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

13. The dual of parallel RC circuit is a

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

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

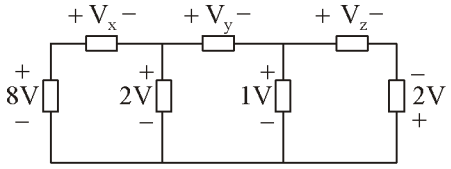
14. Two resistances are connected in parallel and each dissipates 40 W. The total power supplied by the source is equals to

(a) 80 W (b) 40 W

(c) 160 W (d) 20 W

[TNPSC AE - 2018]

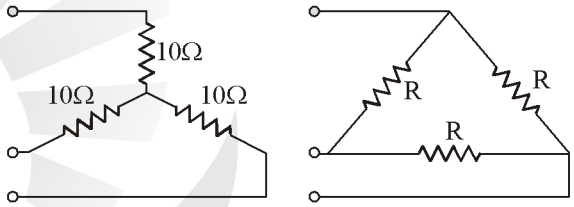
15. The value of V_x, V_y and V_z in figure shown are



(a) –6, 3, –3 (b) –6, –3, 1

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

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



(a) 10 (b) 30

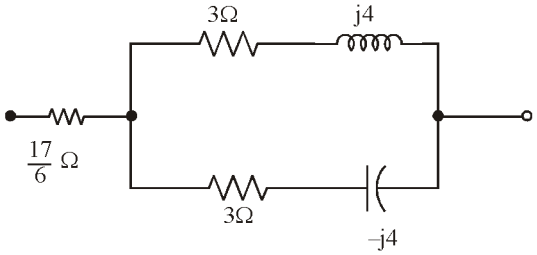
(c) $\frac{10}{3}$ (d) $\frac{20}{3}$

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

(a) 15 W, 350 Ω (b) 10 W, 250 Ω

(c) 12 W, 300 Ω (d) 15 W, 250 Ω

18. For the circuit shown below the total impedance is



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

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

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

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

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

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

(c) A is true but R is false

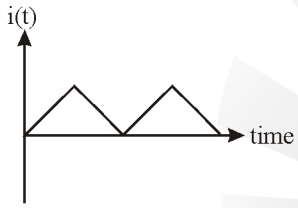
(d) A is false but R is true.

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

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

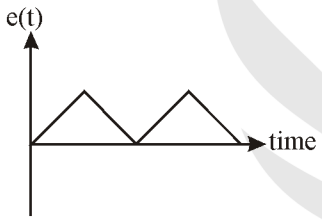
(c) $3\ V_L\ I_L \sin\phi$ (d) $\sqrt{3}\ V_L\ I_L \tan\phi$

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

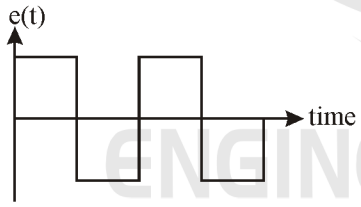


The wave form of the induced voltage in the inductor will be.

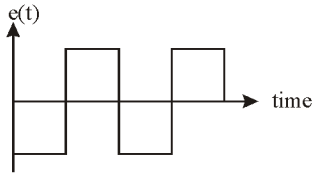
(a)



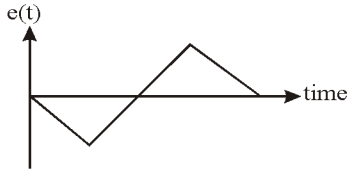
(b)



(c)



(d)



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

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

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

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

(a) Doubled

(b) Halved

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

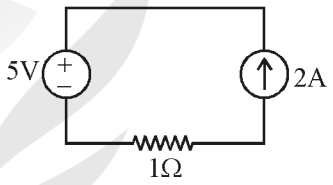
(d) Increased by $\sqrt{2\pi}$

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

(a) 0.5×10^{-6} V (b) 0.5 V

(c) 2×10^{-6} V (d) 2 V

25. For the circuit shown in figure



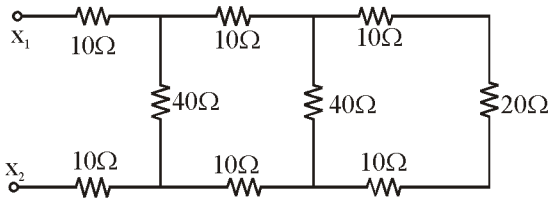
(a) The current depends on the resistor

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

(c) The current depends on the voltage source

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

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



(a) 60 Ω (b) 40 Ω

(c) 80 Ω (d) 20 Ω

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

(a) Would half

(b) Would double

(c) Would remain the same

(d) Would increase by a factor of 4

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

(a) Line current is equal to the phase current

(b) Line current is three times the phase current

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

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

29. Which of the following statement is true?

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

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

(c) Capacitors are generally less lossy than inductors

(d) Linear networks can have dependent sources.

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

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

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

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

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

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

(a) 11 (b) 33

(c) 22 (d) 44

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

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

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

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

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

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

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

(a) Resistance of W_1 is half that of W_2

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

(c) Resistance of W_1 is twice that of W_2

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

35. Consider the following statements.

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

Which of the above statements are TRUE.

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

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

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

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

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

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

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

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

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

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

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

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

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

$$= 0.125$$

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

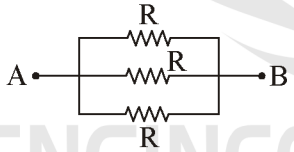
$$\text{Energy} = 450000\ J$$

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

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

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

Redraw the circuit



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

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

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

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

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

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

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

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

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

$$R_1 = 4R$$

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

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

$$dQ = 8 \times 1.3$$

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

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

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

$$I = 0.19\ A$$

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

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

$$= 333.33\ \Omega$$

$$V = IR$$

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

$$= 10\ V$$

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

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

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

$$= 40\ W$$

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

Given $\rho = 0.56$ ohm-em

$l = 440$ cm

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

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

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

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

57. ***Ans. (c)***

Connected in series

$$\Rightarrow \quad \frac{V^2}{3R} = 15$$

$$\frac{V^2}{R} = 45$$

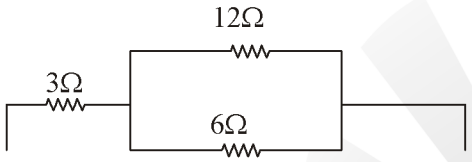
Connected in parallel

$$\frac{3V^2}{R} = 3 \times 45$$

$$= 135 \text{ W}$$

58. ***Ans. (a)***

59. ***Ans. (b)***



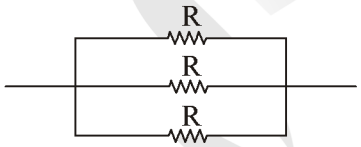
$$R_{eq} = 3 + (6 \parallel 12)$$

$$= 3 + \frac{6 \times 12}{12 + 6}$$

$$R_{eq} = 7\Omega$$

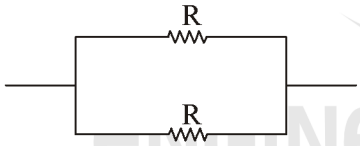
60. ***Ans. (b)***

(a)



$$R_a = R \parallel R \parallel R = R/3$$

(b)



$$R_b = R \parallel R = R/2$$

$$\Rightarrow \quad R_b > R_a$$

61. ***Ans. (b)***

$$I_T = I_1 + I_2 + I_3 + I_4 + I_5$$

$$I_5 = 600 - 260 = 340 \text{ mA}$$

62. ***Ans. (b)***

Power is additive in any configuration of resistive circuit

$$P_T = 1.6 + 1.6 + 1.6 + 1.6$$

$$= 6.4 \text{ W}$$

63. ***Ans. (a)***

Total Power Loss = 100 + 60 = 160 W

64. ***Ans. (a)***

Let the two resistors are R and 1.5 R

$$\frac{R \times 1.5R}{2.5R} = 6$$

$$R = 10\ \Omega$$

Second resistor is $1.5 \times 10 = 15\ \Omega$

65. ***Ans. (a)***

66. ***Ans. (c)***

67. ***Ans. (c)***

68. ***Ans. (a)***

$$V_{PP} = 2V_{max}$$

$$= 2 \times 13V = 26V$$

69. ***Ans. (b)***

70. ***Ans. (b)***

Rating in Amp-hour = 8A × 6h = 48 Ah

71. ***Ans. (a)***

$$\text{kWh} = 500 \times 25 \times 10^{-3}$$

$$= 12.5 \text{ kW}$$

72. ***Ans. (b)***

$$\text{kWh} = 350 \times 30 \times 24$$

$$= 252 \text{ kWh}$$

73. ***Ans. (d)***

74. ***Ans. (b)***

$$I_{rms} = \sqrt{10^2 + \left(\frac{10}{\sqrt{2}}\right)^2}$$

$$I_{rms} = 12.24 \text{ A}$$

75. ***Ans. (b)***

$$\text{Average Value} = \frac{V_m}{2}$$

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

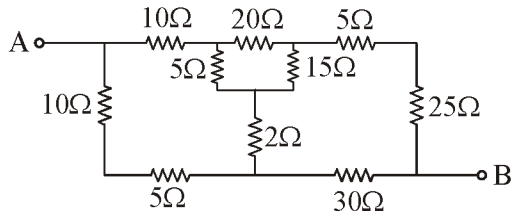
76. ***Ans. (b)***

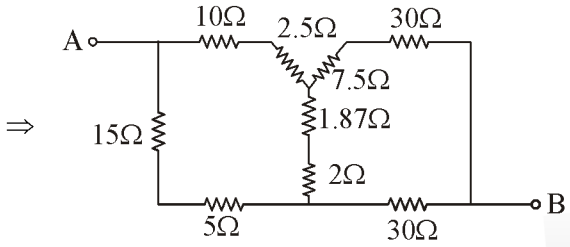
$$R_{eq} = \frac{2 \times 2}{2 + 2} = 1\Omega$$

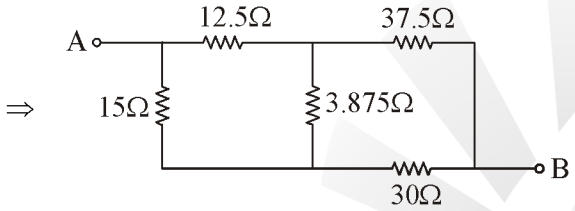
Wattage rating is additive in parallel resistance network.

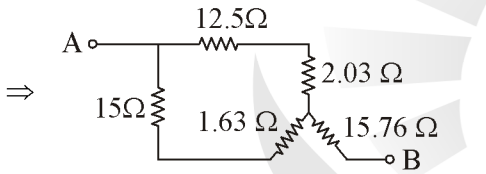
$\therefore$ 2W + 2W = 4W

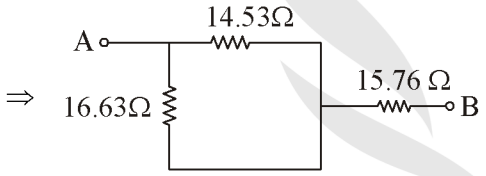
77. ***Ans. (b)***







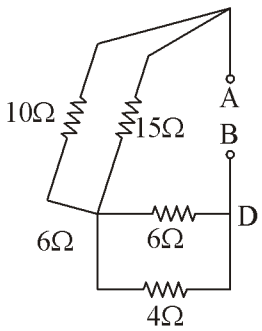




$$R_{AB} = \frac{14.53 \times 16.63}{14.53 + 16.63} + 15.76$$

$$= 23.53\ \Omega$$

78. ***Ans. (a)***



$$R_{AB} = 6 + 2.4$$

$$= 8.4\ \Omega$$

79. ***Ans. (a)***

Since lamps are connected in series and voltage across each lamp = 6.0 V

$\therefore$ Voltage of supply $(V_S) = 10 \times 6 = 60$ V

80. ***Ans. (a)***

Total resistance $(R_{eq}) = 3 \parallel 6 + 2$

$$= \frac{3 \times 6}{6 + 3} + 2$$

$$= 4\Omega$$

Total current drawn from the cell

$$= \frac{1.6}{4} = 0.4 \text{ A}$$

$$I_1 = \frac{6}{3 + 6} \times 0.4 = 0.267 \text{ A}$$

$$V_{3\Omega} = 0.267 \times 3 = 0.8 \text{ V}$$

81. ***Ans. (b)***

Voltage drop per unit length

$$= \frac{2.38}{35} = 0.068 \ \frac{\text{V}}{\text{cm}}$$

82. ***Ans. (c)***

When the element is having property of internal amplification then element is called as active element.

83. ***Ans. (a)***

84. ***Ans. (d)***

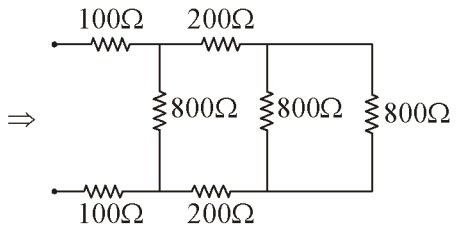
$$R_1 = \frac{20 \times 40}{20 + 40 + 40} = 8\Omega$$

$$R_2 = \frac{40 \times 40}{20 + 40 + 40} = 16\Omega$$

$$R_3 = \frac{20 \times 40}{20 + 40 + 40} = 8\Omega$$

85. ***Ans. (c)***

86. ***Ans. (c)***



$$R_{eq} = 600\ \Omega$$

87. ***Ans. (c)***

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

$$R \propto \frac{1}{a}$$

88. ***Ans. (a)***

89. ***Ans. (b)***

90. ***Ans. (c)***

91. ***Ans. (b)***

92. ***Ans. (a)***

93. ***Ans. (b)***

$$R_{AB} = \frac{20 \times 20}{40}$$

$$= 10\ k\Omega$$

94. ***Ans. (c)***

$$i = \frac{Q}{t} = \frac{0.1}{0.05} = 2A$$

95. ***Ans. (b)***

$$P_{Series} = \frac{P_1 \times P_2}{P_1 + P_2} = \frac{200 \times 100}{200 + 100}$$

$$= 66.6\ W$$

96. ***Ans. (c)***

$$R_{eq} = 100 + \left(\frac{1}{50} \| \frac{1}{75} \| \frac{1}{50}\right)$$

$$= 100 + 18.75$$

$$= 118.75\ \Omega$$

97. ***Ans. (b)***

$$R = \rho \frac{\ell}{a}$$

$$\rho = \frac{R \cdot a}{\ell}$$

$$= \frac{5 \times 0.025}{2.2} = 0.057\ \Omega m$$

98. ***Ans. (c)***

99. ***Ans. (b)***

$$I = \frac{P}{V} = \frac{100}{200} = 0.5\ A$$

$$n \times 0.5 = 13$$

$$n = 26$$

100. ***Ans. (a)***

Conductance is the measure of how easily electricity or flow of current flows along a certain path through an electrical element

$$\text{conductance} = \frac{1}{\text{Resistance}}.$$

101. ***Ans. (a)***

102. ***Ans. (b)***

$$R_t = R_0[1 + \alpha \Delta t]$$

$$16 = R_0[1 + 0.003 \times 50]$$

$$R_o = 13.9 \simeq 14\Omega$$

103. ***Ans. (d)***

$$I = \frac{dq}{dt} \Rightarrow \frac{\text{coulomb}}{\text{sec}}$$

so (d) is correct answer.

104. ***Ans. (c)***

$$C = \varepsilon \frac{A}{d}$$

where A = area

d = distance between plates

105. ***Ans. (a)***

106. ***Ans. (c)***

$$R = \frac{V^2}{P_L} = \frac{250^2}{1000} = 62.5$$

$$l = \frac{62.5}{1} = 62.5 \text{ m}$$

107. ***Ans. (a)***

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

$$= 1.72 \times 10^{-8} \times \frac{1\times10^3}{\pi\times10^{-6}}$$

$$= 5.5 \text{ ohm}$$

108. ***Ans. (c)***

109. ***Ans. (b)***

$$\frac{\ell_b}{\ell_c} \propto \frac{R_b}{R_c}$$

$$\frac{\ell_b}{\ell_c} = \frac{500}{100} = 5$$

So, l_b is five times longer than l_c.

110. ***Ans. (c)***

Number of nodal equation

$$= N - 1$$
$$= 4 - 1$$
$$= 3$$

Where N is number of node.

111. ***Ans. (c)***

$$R_{series} = R_1 + R_2 + R_3$$
$$= 2 + 4 + 1$$
$$= 7\Omega$$

$$R_{parallel} = \frac{1}{R_{eq}} = \frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{2}+\frac{1}{4}+\frac{1}{1} = \frac{7}{4}$$

$$R_{eq} = 4/7 = 0.571\ \Omega$$

112. ***Ans. (b)***

113. ***Ans. (a)***

Ohm's law does not related to the vacuum tube.

114. ***Ans. (a)***

In case of DC inductor will have as short circuit while capacitor as open. So only resistance can be used in series to reduce voltage.

115. ***Ans. (b)***

116. ***Ample. (c)***

117. ***Ans. (b)***

$$\sigma = \frac{1}{\rho} = \frac{1}{\Omega - m}$$
$$= \Omega^{-1}m^{-1}$$

$$\sigma = \frac{\text{℧}}{m} = \text{℧}m^{-1} = \frac{\text{Simen}}{\text{meter}}$$

118. ***Ans. (c)***

119. ***Ans. (c)***

Series $\Rightarrow$ $3I^2R = 90$

$$\frac{3V^2}{9R^2}R = 90$$

$$\frac{V^2}{R} = 270$$

Parallel $\Rightarrow$

$$\frac{V^2}{R/3} = P$$

$$\frac{3V^2}{R} = P$$

$$P = 3 \times 270 = 810 \text{ W}$$

120. ***Ans. (c)***

121. ***Ans. (b)***

122. ***Ans. (a)***

123. ***Ans. (a)***

$$\frac{1}{R_{eq}} = \frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{10}+\frac{1}{15}+\frac{1}{30}$$

$$\frac{1}{R_{eq}} = \frac{3+2+1}{30}$$

$$R_{eq} = \frac{30}{6} = 5\Omega$$

124. ***Ans. (b)***

$$V = I \times R$$
$$= 2 \times 33$$
$$= 66V$$

125. ***Ans. (c)***

$$R = \frac{V}{I} = \frac{240}{300}$$
$$R = 800\ \Omega$$

126. ***Ans. (c)***

127. ***Ans. (d)***

128. ***Ans. (a)***

129. ***Ans. (b)***

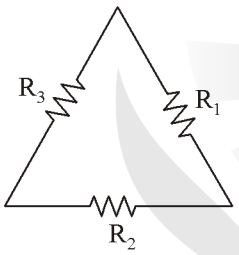
130. ***Ans. (a)***

131. ***Ans. (c)***

132. ***Ans. (c)***

133. ***Ans. (a)***

Delta → star



$$\text{star branch} = \frac{R_1R_3}{R_1+R_2+R_3}$$
$$= \frac{R_2R_3}{R_1+R_2+R_3}$$
$$= \frac{R_2R_1}{R_1+R_2+R_3}$$

134. ***Ans. (c)***

135. ***Ans. (d)***

ABCD - Parameter

$$V_1 = AV_2 + BI_2$$
$$I_1 = CV_2 + DI_2$$

So, Input impedance $= \left.\frac{V_1}{I_1}\right|_{I_2=0}$

$$= \frac{A}{C}$$

136. ***Ans. (b)***

137. ***Ans. (c)***

138. ***Ans. (b)***

139. ***Ans. (d)***

$$R_{eq} = 8 + (12 \parallel 24)$$
$$= 8 + 8 = 16\ \Omega$$

140. ***Ans. (b)***

Resistance of delta equalent branch
= 3 (star equalent branch)
= 3 R/2

141. ***Ans. (a)***

No. of Mesh/loop = b – n + 1
= 10 – 7 + 1 = 4

142. ***Ans. (d)***

143. ***Ans. (a)***

Current in D_1 ; $I_1 = 0$

Current in D_2 ; $I_2 = \frac{5-3}{500} = 4 \times 10^{-3}$
$= 4$ mA

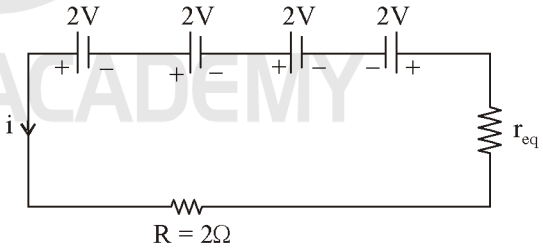
144. ***Ans. (a)***

145. ***Ans. (c)***

146. ***Ans. (a)***

147. ***Ans. (a)***

148. ***Ans. (b)***



each cell has 0.5 Ω internal resistance

$$E_{eq} = 2 + 2 + 2 - 2 = 4 \text{ volt}$$
$$r_{eq} = (0.5)\ 4 = 2\ \Omega$$

$$\therefore \quad i = \frac{E_{eq}}{r_{eq}+R} = \frac{4}{2+2} = 1 \text{ Amp}$$

536. ***Ans. (b)***

$$Y = \frac{1}{j\omega L} + \frac{1}{R + \frac{1}{j\omega C}}$$

$$= \frac{1}{j\omega L} + \frac{R + j/\omega C}{R^2 + \left(\frac{1}{\omega C}\right)^2}$$

$$= \frac{j}{\omega L} + \frac{j}{\omega C\left(R^2 + \frac{1}{\omega C}\right)^2} + \frac{R}{R^2 + \left(\frac{1}{\omega C}\right)}$$

For resonance, imaginary term is equal to zero.

$$\frac{1}{\omega L} = \frac{1}{\omega C\left(R^2 + \left(\frac{1}{\omega C}\right)^2\right)}$$

$$\frac{C}{L} = \frac{1}{R^2 + \left(\frac{1}{\omega C}\right)^2}$$

$$\left(\frac{1}{\omega C}\right)^2 = \frac{L}{C} - R^2$$

$$\omega = \frac{1}{C\sqrt{\frac{L}{C} - R^2}} = \frac{1}{1\sqrt{4-1}}$$

$$= \frac{1}{\sqrt{3}} \text{ rad/sec}$$

537. ***Ans. (a)***

$$\tau = RC$$

$$0.1 = R \times 2\mu F$$

$$R = \frac{1.0}{2\mu F} = 0.05\ M\Omega$$

538. ***Ans. (a)***

$$I(t) = \frac{V}{R}(1 - e^{-t/\tau})$$

$$t = \frac{L}{R} = \frac{1}{2}$$

$$\tau = 0.5$$

$$I(t) = \frac{10}{2}(1 - e^{-2t})$$

When $t = 10$ sec

$$I(10) = 5(1 - e^{-20})$$

$$I(10) \simeq 5 \text{ A}$$

539. ***Ans. (b)***

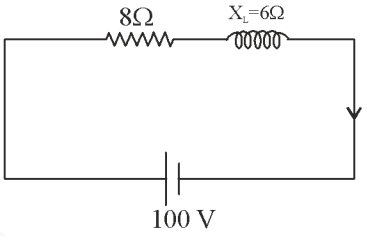
$$X_L = \omega L = 10$$

$$X_C = \frac{1}{\omega C} = 100$$

$$X_C > X_L$$

$\therefore$ Current in series RLC circuit leads the applied voltage.

540. ***Ans. (c)***



$$\text{P.F.} = \frac{R}{Z} - \frac{8}{\sqrt{8^2 + 6^2}}$$

$$= 0.8 \text{ lagging}$$

541. ***Ans. (b)***

At half power frequency, impedance

$$= R - jR$$

$$= \sqrt{2}R\ \Omega$$

542. ***Ans. (b)***

$$\text{Active power} = 60W$$

$$\text{Reactive power} = 80VAR$$

$$\text{Apparent power} = \sqrt{60^2 + 80^2}$$

$$= 100 \text{ VA}$$

$$\therefore \text{ Power factor} = \frac{\text{Active power}}{\text{Apperant power}}$$

$$= \frac{60}{100} = 0.6 \text{ lagging}$$

543. ***Ans. (d)***

As per given circuit,

$$\frac{1}{Y} = \frac{1}{3 + j4} + \frac{1}{5 - j10}$$

$$= \frac{3 - j4}{25} + \frac{5 + j10}{125}$$

$$\text{Susceptance} = \frac{10}{125} - \frac{4}{25}$$

$$= \frac{10 - 20}{125} = \frac{-10}{125}$$

$$= 0.08\ \Omega$$

544. ***Ans. (d)***

At steady state, capacitor is open circuited.

$\therefore$ Entire voltage appear across the capacitor.

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

545. ***Ans. (a)***

For pure inductive circuit, energy consumed is zero.

546. ***Ans. (b)***

$$P = \sqrt{3}\, V_L I_L \cos\phi$$

$$= 3V_{ph}I_{ph} \cos\phi$$

$\therefore \phi$ is angle between the phase voltage and phase current.

547. ***Ans. (a)***

Given data,

$$V_R + jV_L = 20 \text{ V}$$

$$j(V_L - V_c) = 9 \text{ V}$$

$$V_R + j\,(V_L - V_c) = 15 \text{ V}$$

$$\sqrt{V_R^2 + (V_L - V_C)^2} = 15$$

$$\Rightarrow \quad V^2_R + 81 = 225$$

$$\Rightarrow \quad V_R = 12 \text{ V}$$

and $\quad V_R^2 + V_L^2 = 400$

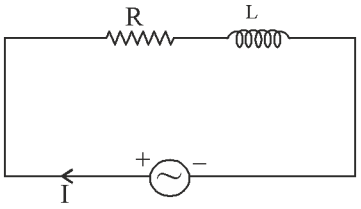
$$\Rightarrow \quad V_L^2 = 400 - 144$$

$$\Rightarrow \quad V_L = 16 \text{ V}$$

and $\quad V_L - V_C = 9 \text{ V}$

$$\Rightarrow \quad V_C = 16 - 9 = 7 \text{ V}$$

548. ***Ans. (c)***



Let $\quad V = V_m \sin\omega t \quad \ldots(1)$

$$I = I_m \sin(\omega t - \phi)$$

$$V_L = L\frac{dI}{dt}$$

$$\Rightarrow \quad V_L = L\int I_m \sin(\omega t - \phi)\, dI$$

$$= LI_m[-\cos(\omega t - \phi)]$$

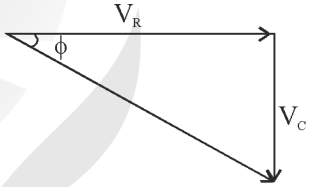
$$= V_m \sin(\omega t - \phi + 90^o)]$$

$$V_L = V_m \sin[\omega t - (90^o - \phi] \ldots(2)$$

By comparing (1) and (2) V_L leads 'V' by an angle of $90 - \phi$.

549. ***Ans. (a)***

550. ***Ans. (d)***



$$V = IR - jV_C$$

$$(35)^2 = V^2_R + (28)^2$$

$$\Rightarrow \quad V_R = 21 \text{ V}$$

$$\cos\phi = \frac{V_R}{V_C}$$

$$\Rightarrow \quad \phi = \cot^{-1}\left(\frac{21}{28}\right)$$

$$= \cot^{-1}(0.75)$$

❑❑❑

AC Circuits and Resonance Solutions
SCAN ME

277. ***Ans. (a)***

$$B = \mu H \qquad \left\{H = \frac{NI}{l};\ H \propto \frac{1}{l}\right\}$$

$$B = \frac{\mu NI}{l}$$

$$B \propto \frac{1}{l}$$

So if distance is decrease magnetic flux density will be increase.

278. ***Ans. (b)***

279. ***Ans. (b)***

280. ***Ans. (b)***

Flux in a magnetic circuit is analogous to current in an electric circuit.

281. ***Ans. (c)***

282. ***Ans. (c)***

Life of a lead acid battery is two to five year. lead acid battery something 1200 time charge or discharge.

283 ***Ans. (b)***

The capacity of storage battery is exprssed in two type.

(i) Watt hour

(ii) Ampere hour

Ampere hour capcity efficiency range 90 – 95%

Watt hour capacity efficiency range 70 – 80%.

284. ***Ans. (a)***

285. ***Ans. (c)***

$$I = \frac{E}{R + \frac{r}{n}}$$

286. ***Ans. (c)***

287. ***Ans. (d)***

288. ***Ans. (b)***

The attractive power of an iron cored solenoid is more then that of air cored salenoid.

289. ***Ans. (b)***

290. ***Ans. (a)***

291. ***Ans. (d)***

A dielectric medium is said to be linear if the permittivity is not a function of the electric force.

292. ***Ans. (d)***

It is the gradient of a scalar potential, is the wrong statement.

293. ***Ans. (d)***

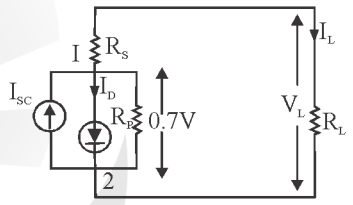
The unit of magnetic charge is Ampere meter square.

294. ***Ans. (c)***

295. ***Ans. (a)***

296. ***Ans. (b)***

The equivalent circuit of PV cell is shown below.



Assume that the diode is ON. Then he voltage between nodes 1 and 2 is 0.7 V with 1, +ve.

On O.C, $R_L = \infty$, $I_L = 0$

$V_L = V_{OC} = 0.7$ V

On S.C, $R_L = 0$

$$I_L = \frac{0.7}{R_S + R_L} = \frac{0.7}{R_S} = I_{SC}$$

At maximum power $R_s = R_L$

Then, $$I_L = \frac{0.7}{R_S + R_L} = \frac{0.7}{2R_S} = \frac{I_{SC}}{2}$$

$$V_L = \frac{0.7}{2R_S} = 0.35 \text{ V}$$

Thus, at maximum power,

$$V_L < V_{OC}$$

and $$I_L < V_{SC}$$

297. *Ans. (c)*

298. *Ans. (d)*

299. *Ans. (a)*

300. *Ans. (d)*

Matertials that have relative permeability slightly greater than 1 but much less than 1.1 are called paramagnetic materials. Aluminium and platinum oxygen are such materials.

301. *Ans. (d)*

302. *Ans. (c)*

❑❑❑

SCAN
QR CODE

To Download
Nimbus Learning App

To Online Free Classes
Nimbus Learning Youtube Channel

Online Test Series

Electrical Telegram

EA-Match (old) : Till 2022

EA-Match (new) : 2023

Full Length Mock Test

Mock Test-1

Mock Test-2

Mock Test-3

Mock Test-4

Mock Test-5