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ELECTRICAL ENGINEERING

Objective Practice Sets

Electric Circuits

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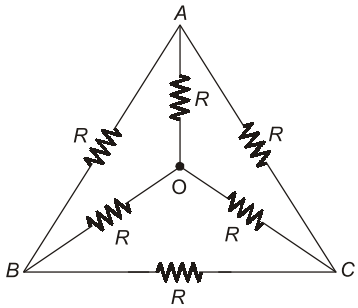
1 CHAPTER
Circuit Element and Energy Sources

MCQ and NAT Questions

Q.1 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) $\frac{6}{11}R$

Q.2 The equivalent star impedance of a balanced delta connected load of value $6 + j9\ \Omega$ is given by

(a) $9 + j6\ \Omega$ (b) $2 + j3\ \Omega$

(c) $18 + j27\ \Omega$ (d) $6 - j9\ \Omega$

Q.3 A network contains only independent current sources and resistors. If the values of all resistors are doubled, the values of the node voltages

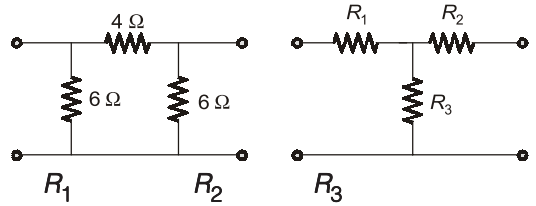
(a) will become half

(b) will remain unchanged

(c) will become double

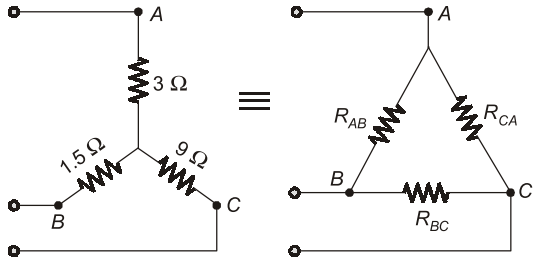
(d) cannot be determined unless the circuit configuration and the values of the resistors are known

Q.4 The value of R_1, R_2 and R_3 of the equivalent 'T' network for the given π network will be such that



	R_1	R_2	R_3
(a)	2.25 Ω	1.5 Ω	1.5 Ω
(b)	1.5 Ω	1.5 Ω	2.25 Ω
(c)	2.25 Ω	1.5 Ω	2.25 Ω
(d)	1.5 Ω	2.25 Ω	1.5 Ω

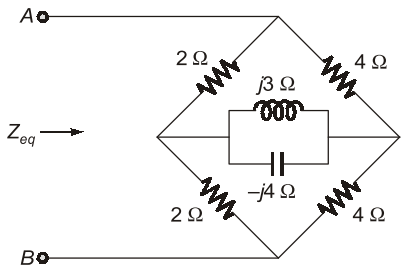
Q.5 For the equivalent figure circuit shown in the given figure, the values of R_{AB} and R_{BC} are respectively



(a) 5 Ω and 15 Ω (b) 15 Ω and 30 Ω

(c) 30 Ω and 5 Ω (d) 20 Ω and 35 Ω

Q.6 In the circuit of figure. The equivalent impedance seen across terminals A, B is _____ Ω.

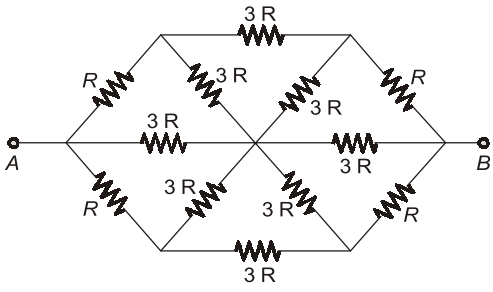


Q.7 If each branch of a delta circuit has impedance $Z/\sqrt{3}$ then, each branch of the equivalent Y circuit has impedance.

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

(c) $3\sqrt{3}Z$ (d) $Z/3$

Q.8 The equivalent resistance between terminals A and B for the circuit shown is:

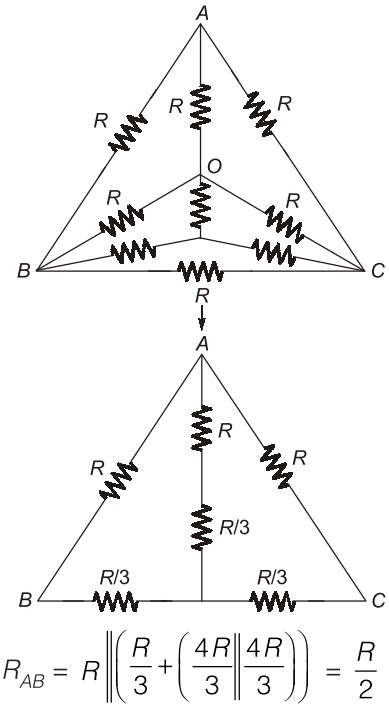


Answers Circuit Element and Energy Sources

1. (c)	2. (b)	3. (c)	4. (b)	5. (a)	6. (2.67)	7. (b)	8. (c)
9. (b)	10. (c)	11. (d)	12. (a)	13. (c)	14. (b)	15. (a)	16. (d)
17. (a)	18. (b)	19. (d)	20. (d)	21. (c)	22. (a)	23. (a)	24. (b,c)
25. (a,b)	26. (a,b,c,d)	27. (a,b,d)	28. (a,c,d)	29. (a,c,d)			

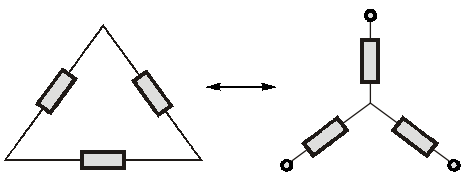
Explanations Circuit Element and Energy Sources

1. (c)



$$R_{AB} = R\left\|\left(\frac{R}{3}+\left(\frac{4R}{3}\right\|\frac{4R}{3}\right)\right) = \frac{R}{2}$$

2. (b)



$$Z' = \frac{Z\times Z}{3Z} = \frac{Z}{3} = \frac{6+j9}{3} = 2 + j3\ \Omega$$

3. (c)

Since the network contains only independent current sources, so changing resistors in the same proportion the current through each branch will remain same but node voltages will change in the same proportion. Hence, doubling all resistors, node voltages will be doubled.

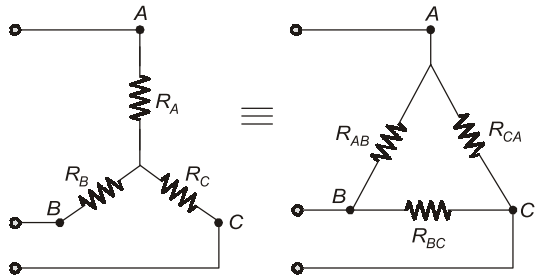
4. (b)

$$R_1 = \frac{4\times 6}{4+6+6} = \frac{24}{16} = 1.5\ \Omega$$

$$R_2 = \frac{6\times 4}{16} = 1.5\ \Omega$$

$$R_3 = \frac{6\times 6}{16} = 2.25\ \Omega$$

5. (a)



$$R_{AB} = R_A + R_B + \frac{R_A R_B}{R_C}$$

$$R_{AB} = 3 + 1.5 + \frac{3\times 1.5}{9}$$

$$= 3 + 1.5 + 0.5 = 5\ \Omega$$

$$R_{BC} = 9 + 1.5 + \frac{9\times 1.5}{3}$$

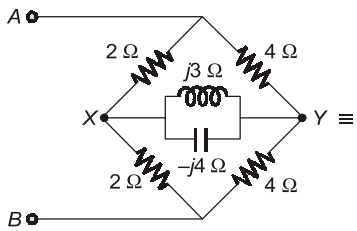
$$= 9 + 1.5 + 4.5 = 15\ \Omega$$

$$R_{CA} = R_A + R_C + \frac{R_A R_C}{R_B}$$

$$= 3 + 9 + \frac{3\times 9}{1.5} = 30\ \Omega$$

6. Sol.

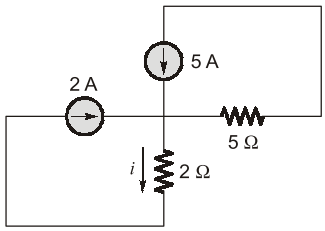
The above circuit is a wheatstone bridge circuit, thus no current will flow through branch XY.



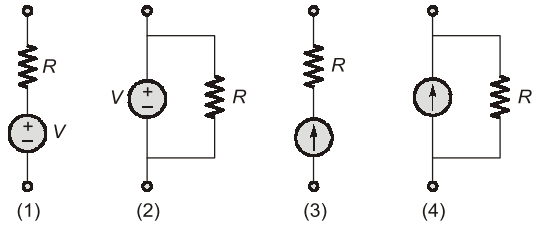
2 CHAPTER
Network Laws, Mesh and Nodal Analysis

MCQ and NAT Questions

Q.1 The value of current 'i' in the circuit shown below is _____ A.

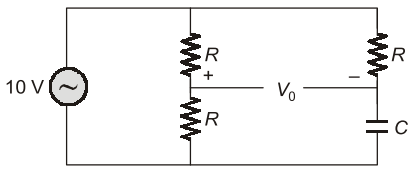


Q.2 Consider the following networks. Which of the circuit is redundant of connecting resistor?



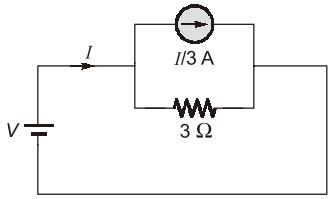
(a) 1 and 3 (b) 2 and 3
(c) 3 and 4 (d) 1 and 2

Q.3 In the circuit shown in the figure, output $|V_0(j\omega)|$ is



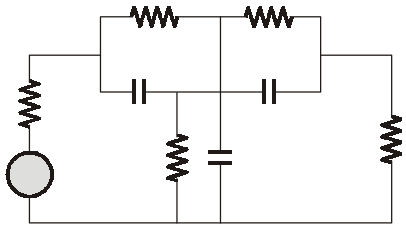
(a) indeterminable as values of R and C are not given
(b) 2.5 V
(c) $5\sqrt{2}$ V
(d) 5 V

Q.4 In the circuit shown in the figure, the effective resistance faced by the voltage source is



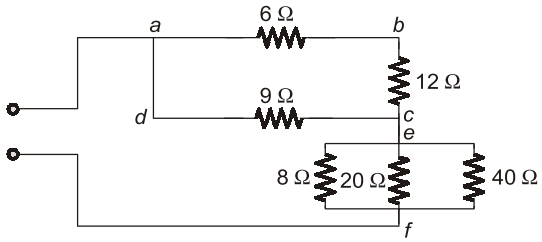
(a) 1 Ω (b) 2 Ω
(c) 3 Ω (d) 3.3 Ω

Q.5 The minimum number of equation required to analyze the circuit shown in figure is



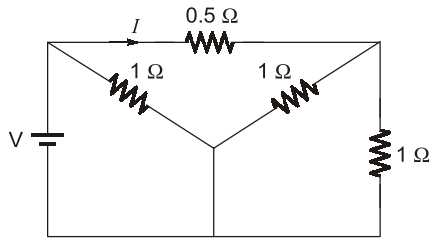
(a) 5 (b) 4
(c) 6 (d) 7

Q.6 The total resistance of the circuit in figure is,



(a) 10 ohm (b) 5 ohms
(c) 6 ohms (d) 11 ohms

Q.7 In the circuit shown in the figure, if I = 2 A, then the value of the battery voltage V will be

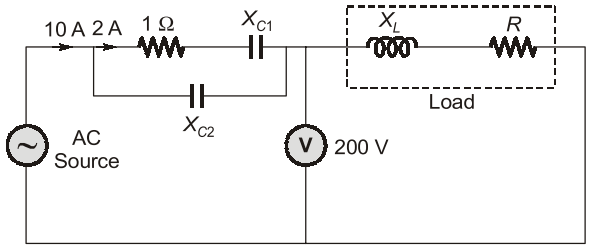


(a) 5 V (b) 3 V
(c) 2 V (d) 1 V

Q.8 In the circuit shown in the figure, the value of current i_4 will be

(a) Power factor of the entire system is 0.985 (leading).
(b) Total active power = 4000 W
(c) Total reactive power = 850 KVAR
(d) For $V_{S\,rms} = 120\angle 45°$ V, $I_{rms} = 35.55\angle 55.11°$A

Q.55 For the circuit shown below, the total power dissipated in the circuit is 1 kW and the voltmeter reads 200 V.



Which of the following is correct?
(a) The value of load resistance $R = 9.96\ \Omega$.
(b) Voltage drop across R is 99.6 V.
(c) Voltage drop across inductor, $V_{XL} = 173.43$ V
(d) The value of $X_L = 20\ \Omega$.

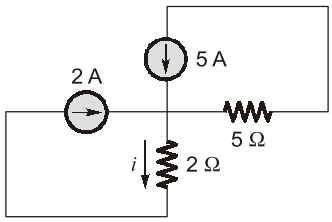
■■■■

Answers Network Laws, Mesh and Nodal Analysis

1. (2)	2. (b)	3. (a)	4. (b)	5. (b)	6. (d)	7. (c)	8. (a)	9. (a)
10. (22.5)	11. (d)	12. (b)	13. (c)	14. (b)	15. (b)	16. (c)	17. (d)	18. (a)
19. (a)	20. (c)	21. (c)	22. (b)	23. (c)	24. (b)	25. (a)	26. (b)	27. (c)
28. (a)	29. (b)	30. (c)	31. (a)	32. (a)	33. (b)	34. (d)	35. (a)	36. (a)
37. (c)	38. (b)	39. (a)	40. (d)	41. (c)	42. (45.33)	43. (d)	44. (d)	45. (b)
46. (d)	47. (a,b)	48. (a,d)	49. (a,b,c)	50. (a,b,d)	51. (a,c)	52. (a,c)	53. (c,d)	54. (a,d)
55. (a,b,c)								

Explanations Network Laws, Mesh and Nodal Analysis

1. Sol.



From the circuit we can directly see that, $i = 2$ A.

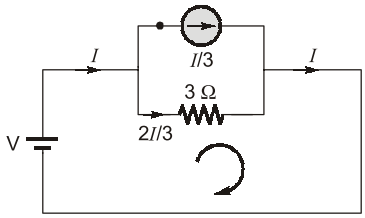
2. (b)

Resistor in parallel to voltage sources and resistor in series to current source is considered as redundant/not useful.

3. (a)

Without knowing values of R and C, it is not possible to calculate $V_0(j\omega)$.

4. (b)



Redrawing the given circuit,

Applying KVL, $V = \frac{2I}{3} \times 3 \Rightarrow V = 2I$

$\therefore \quad \frac{V}{I} = 2\ \Omega$ = source resistance

5. (b)

Circuit can be redrawn as,