Network Analysis

Basic Concepts

34. An ideal constant voltage source is connected in series with an ideal constant current source. Considered together, the combination will be a

a. Constant voltage source
b. Constant current source
c. Constant voltage and a constant current source or a constant power source
d. Resistance

36. A 10V battery with an internal resistance of 1Ω is connected across a non-linear load whose v-i characteristic is given by

$$7i = v^2 + 2v$$

The current delivered by the battery is

a. 2.5 A
b. 5A
c. 6A
d. 7A

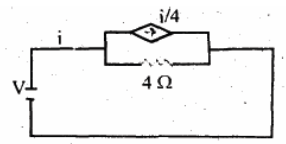
38. Match List-I (Loop concept) with List-II (Junction concept) and select the correct answer using the codes given below the Lists:

List-I
A. Mesh
B. Outside mesh
C. Mesh current
D. Number of meshes

List-II
1. Number of nodes
2. Node voltage
3. Reference node
4. Node

	A	B	C	D
a.	3	4	1	2
b.	3	4	2	1
c.	4	3	2	1
d.	4	3	1	2

39. In the network shown in the figure, the effective resistance faced by the voltage source is



a. 4Ω
b. 3Ω
c. 2Ω
d. 1Ω

33. The Fig. 1 shows a network, in which the diode is an ideal one.

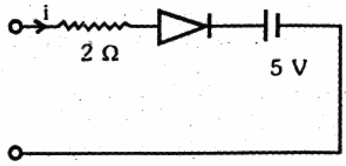
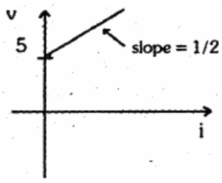


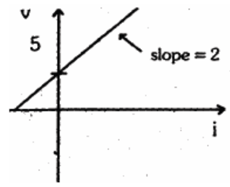
Fig. 1

the terminal v – I characteristics of the network is given by

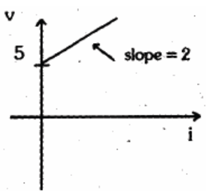
a.



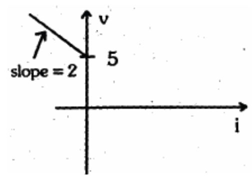
b.



c.



d.



23. Consider the following :

Energy storage capability of basic passive elements is due to the fact that

1. resistance dissipates energy
2. capacitance stores energy
3. inductance dissipates energy

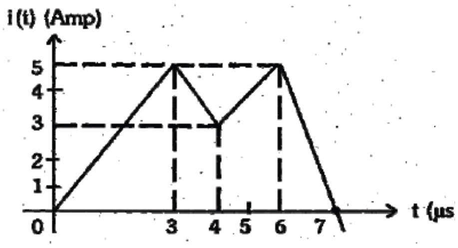
Which of the above is/are correct?

a. 1, 2 and 3
b. 1 and 3
c. 3 alone
d. 1 and 2

24. $\sqrt{\frac{L}{C}}$ has the dimension of

a. time
b. capacitance
c. inductance
d. resistance

26. A current i(t) as shown in the figure is passed through a capacitor.



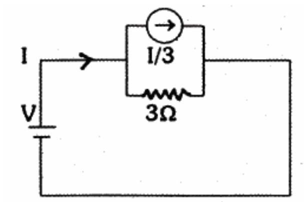
The charge (in micro-coulomb) acquired by the capacitor after 5 µs is

a. 7.5
b. 13.5
c. 14.5
d. 15

34. Four resistance 80Ω, 50Ω, 25Ω and R are connected in parallel. Current through 25Ω resistance is 4A. Total current of the supply is 10 A. The value of R will be

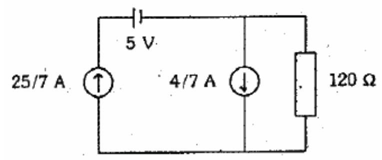
a. 66.66 Ω
b. 40.25 Ω
c. 36.36 Ω
d. 76.56 Ω

25. 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

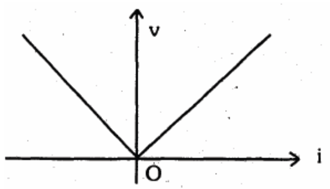
34.



The current through 120 ohm resistor in the circuit shown in the figure is

a. 1 A
b. 2 A
c. 3 A
d. 4 A

35.



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

a. non-linear, active, non-bilateral
b. linear, active, non-bilateral
c. non-linear, passive, non-bilateral
d. non-linear, active, bilateral

75. **Assertion (A):** The Kirchhoff's current law states that the sum of currents entering at any node is equal to the sum of currents leaving that node.
Reason (R): The Kirchhoff's current law is based on the law of conservation of charge.

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

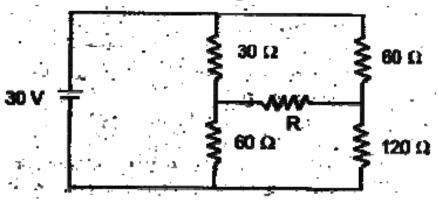
Reason (R) : Law of conservation of charge is the basis of this law.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually 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

54. Six capacitors of different capacitances C_1, C_2, C_3, C_4, C_5 and C_6 are connected in series. $C_1 > C_2 > C_3 > C_4 > C_5 > C_6$.What is the total capacitance almost equal to ?

a. C_1
b. C_3
c. C_4
d. C_6

112. Consider the following circuit



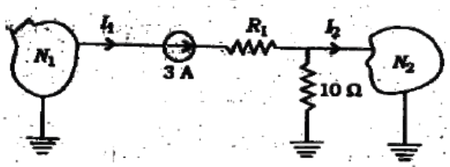
What is the power delivered to resistor R in the above circuit?

a. – 15 W
b. 0 W
c. 15 W
d. Cannot be determined unless the value of R is known

25. A network N' is a dual of network N if

a. both of them have same mesh equations
b. both of them have the same node equations
c. mesh equations of one are the node equations of the other
d. KCL and KVL equations are the same

113. Consider the following circuit:



In the above circuit, the current I_2 is 2 A when the value of R_1 is 20Ω. What will be the value of I_2, when R_1 is changed to 10Ω?

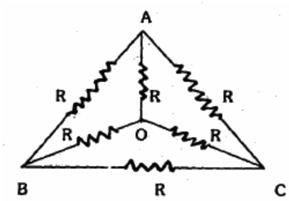
a. 1 A
b. 2 A
c. 3 A
d. 4 A

116. Which one of the following statements is correct?

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

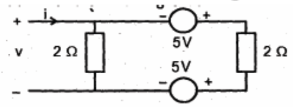
a. increase
b. decrease
c. are unaffected
d. double

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



a. R
b. R -1
c. R/2
d. $\frac{6}{11}R$

31. Consider the following circuit:

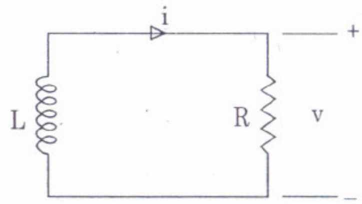


Which one of the following statements is correct?

The circuit shown above is

a. Passive and linear
b. Active and linear
c. Passive and non-linear
d. Active and non-linear

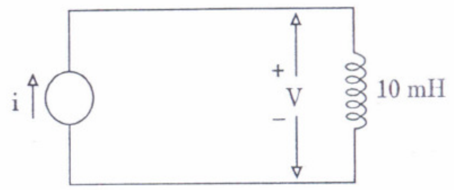
30.



Voltage and current expressions for the above circuit are given at $t \geq 0$ as $v = 125\ e^{-50t}$ V, $i = 5\ e^{-50t}$ A. The value of L will be

(a) 0·005 H
(b) 0·05 H
(c) 0·5 H
(d) 5 H

35.



In the above shown circuit, the independent current source generates zero current for $t < 0$ and a pulse $5\,t\,e^{-4t}$ A, for $t > 0$. At what instant of time, will the current attain the maximum value in the circuit ?

(a) 0·25 sec

(b) 0·5 sec

(c) 1 sec

(d) 2 sec

33. Three parallel resistive branches are connected across a. d.c. supply. What will be the ratio of the branch currents I_1:I_2:I_3 if the branch resistances are in the ratio R_1 : R_2 :R_3::2:4:6?

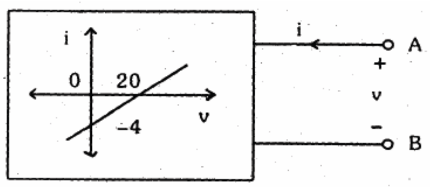
a. 3 :.2 : 6

b. 2:4:6

c. 6:3:2

d. 6:2:4

32.



The resistance seen from the terminals A and B of the device whose characteristic is shown in the figure is

a. – 5 Ω

b. – 1/5 Ω

c. 1/5 Ω

d. 5 Ω

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

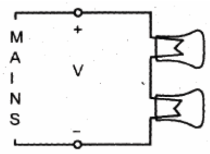
a. Doubled

b. Halved

c. Decreases four times

d. Not changed

85.



The incandescent bulbs rated respectively as P_1 and P_2 operation at a specified mains voltage are connected in for series across the mains as shown in the above figure. Then the total power supplied by the mains to the two bulbs is

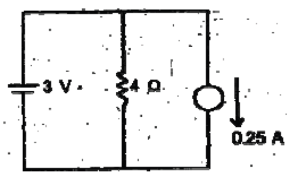
a. $\frac{P_1 P_2}{P_1 + P_2}$

b. $\sqrt{P_1^2 + P_2^2}$

c. $(P_1 + P_2)$

d. $\sqrt{P_1 \times P_2}$

54.



The current flowing through the voltage source in the above circuit is

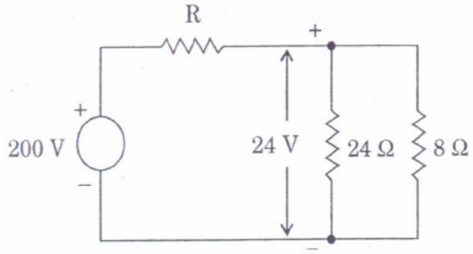
a. 1.0 A

b. 0.75 A

c. 0.5 A

d. 0.25 A

64.



The value of R in the above circuit is

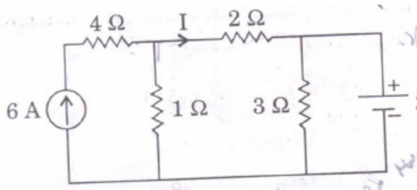
(a) 4 Ω

(b) 40 Ω

(c) 44 Ω

(d) 440 Ω

84.



For the circuit shown above, I is

(a) 0 A

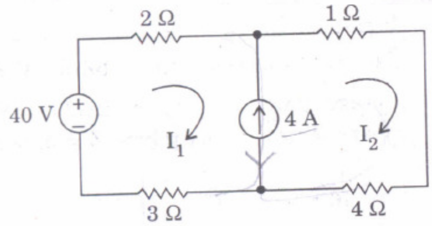
(b) 1 A

(c) 2 A

(d) 3 A

V = IR

88.



The currents I_1 and I_2 in the above circuit are respectively

(a) 4 A; 4 A $V = 2I_1 + 4(I_1 - I_2) + 3I_1$

(b) 3 A; 5 A $V = 1I_2 + 4(I_2 - I_1) + 4I_2$

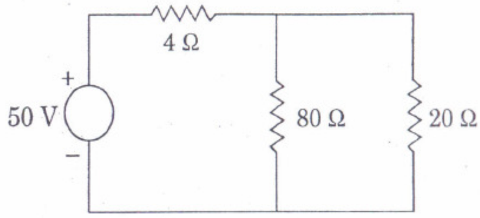
(c) 2 A; 6 A $2V = 2I_1 - 4I_1 + I_2 + 3I_1$ — ③

$V = I_1 + I_2$

(d) 6 A; 2 A $V = I_2 + 4I_2 - I_1$

$V = 9I_2 - I_1$

68.



The value of current in 80 Ω resistor of above circuit is

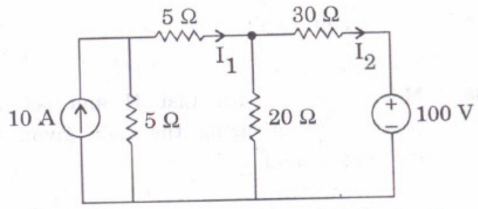
(a) 0·5 A

(b) 2·0 A

(c) 5·0 A

(d) 20·0 A

92.



The currents I_1 and I_2 in the above circuit are respectively

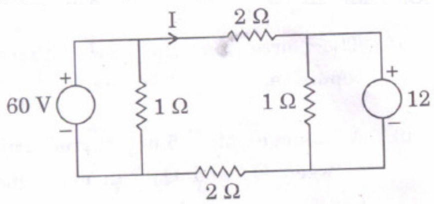
(a) 1·818 A; – 0·4545 A

(b) 2·451 A; – 1·568 A

(c) 0·4545 A; – 1·818 A

(d) 1·56 A; – 2·45 A

105.



For the circuit shown, the value of current, I is

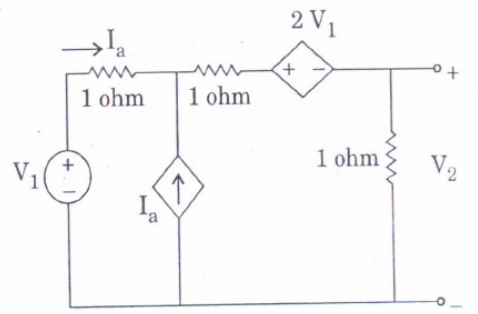
(a) 2 A

(b) 3 A

(c) 6 A

(d) 12 A

13.



The above network contains resistors and controlled sources. $G_{12} = \frac{V_2}{V_1}$ is

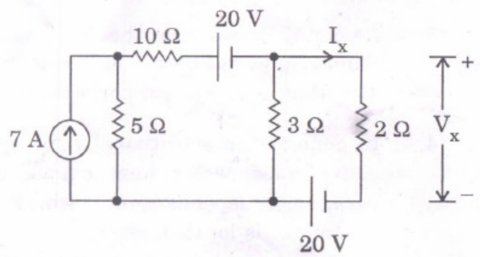
(a) $-\frac{4}{5}$

(b) $-\frac{3}{5}$

(c) $-\frac{2}{5}$

(d) $-\frac{1}{5}$

100.



The current I_x and voltage V_x in the above circuit are, respectively

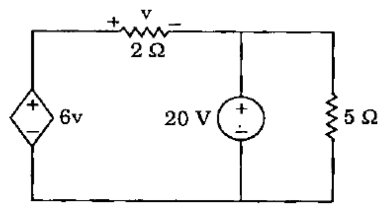
(a) 5 A; 10 V

(b) 10 A; 20 V

(c) 6 A; 12 V

(d) 4 A; 8 V

68.



What is the current through the 2 Ω resistance for the circuit as shown above ?

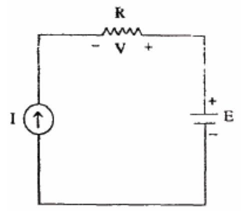
(a) 5 A

(b) 4 A

(c) 3 A

(d) 2 A

103.



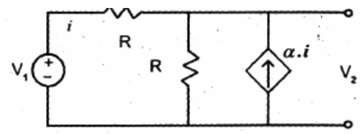
For the circuit shown, what is the voltage V if the source voltage is reduced by 50%?

a. IR + E

b. E – IR

c. 2IR – (E/2)

d. (E/2) – IR



Consider the circuit as shown above which has a current-dependent current source. The value V_2/V_1 is

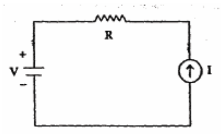
a. 1

b. 2

c. $\frac{1+\alpha}{2+\alpha}$

d. $\frac{\alpha}{2+\alpha}$

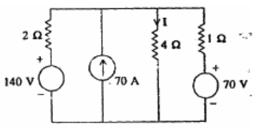
105.



For the network shown in the figure, what is the voltage across the current source I?

a. V – RI
b. V + RI
c. Zero
d. RI – V

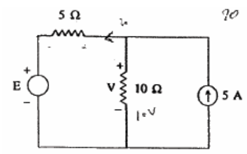
106.



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

a. 20 A
b. 25 A
c. 30 A
d. 36 A

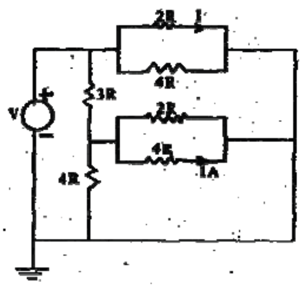
107.



If the voltage V across 10 Ω resistance is 10 V, what is the voltage E of the voltage source in the circuit shown above?

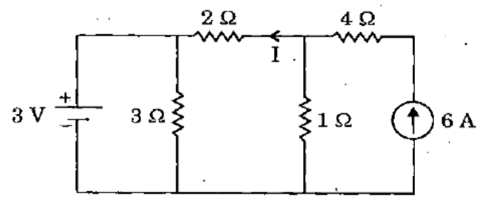
a. -50 V
b. -10 V
c. +10 V
d. +50 V

95. For the circuit shown in the figure, the current 'I' is



a. indeterminable due to inadequate data
b. zero
c. 4 A
d. 8 A

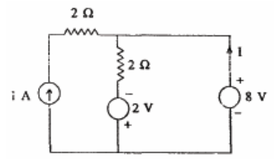
25.



For the circuit as shown above, what is the value of I ?

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

108.



In the circuit shown above, what is the value of the current I?

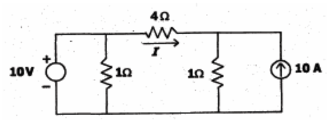
a. 1A
b. 2A
c. 3A
d. 4A

3. Consider a circuit which consists of resistors and independent current sources, and one independent voltage source connected between the nodes i, j. The equations are obtained for voltages of n unknown nodes with respect to one reference node in the form

$$[\Delta]\begin{bmatrix}V_1\\V_2\\\vdots\\V_n\end{bmatrix}=\begin{bmatrix}\vdots\\\vdots\\\vdots\end{bmatrix}$$

What are the elements of the Δ?

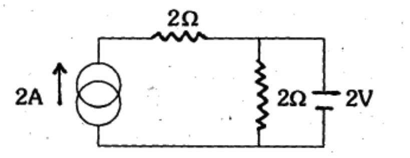
a. All conductances
b. All resistances
c. Mixed conductances and constants
d. Mixed conducances and resistance



In the network shown above, what is the current I in the direction shown ?

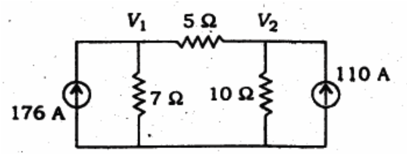
a. 0
b. 1/3 A
c. 5/6 A
d. 4 A

37. The total power consumed in the circuit shown in the figure is



a. 10 V
b. 12 V
c. 16 V
d. 20 V

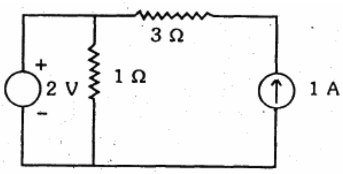
96.



In the circuit shown above, what is the voltage across 5 Ω resistor ?

a. —30V
b. 30V
c. 1250 V
d. —1250 V

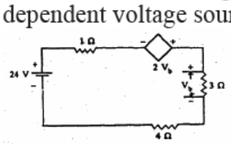
38.



For the circuit given in figure above the power delivered by the 2 volt source is given by

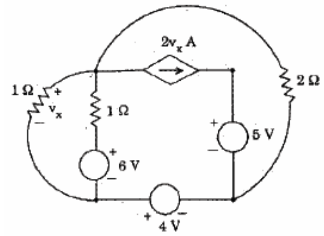
a. 4 W
b. 2 W
c. – 2 W
d. – 4 W

95. The current in the given circuit with a dependent voltage source is



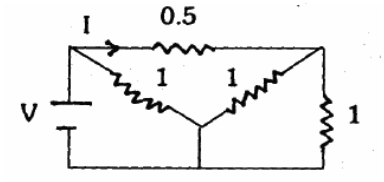
a. 10A
b. 12A
c. 14 A
d. 16A

39. In a network shown in the given figure, the value of v_x would be



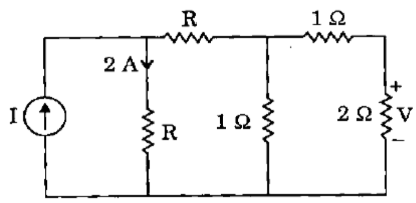
a. -8/9 V
b. 8/9V
c. 16/9V
d. -16/9 V

38. In the circuit shown in the figure, If I = 2, then the value of the battery voltage V will be



a. 5 V
b. 3 V
c. 2 V
d. 1 V

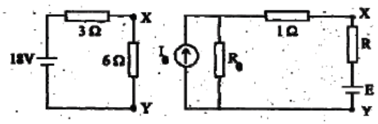
81.



What is the value of I for the above shown circuit, if V = 2 volts ?

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

57.



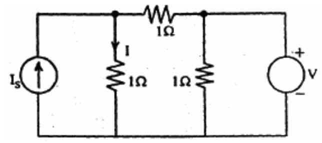
If the two circuits shown above are equivalent, then which of the following is/are correct?

1. E = 2V, R = 5Ω
2. E = 4V, R = 4Ω
3. E = 6V, R = 3Ω
4. E = 10V, R = 1Ω

Select the correct answer using the codes given below:

a. Only 1 and 2
b. Only 3
c. 1, 2, 3 and 4
d. None

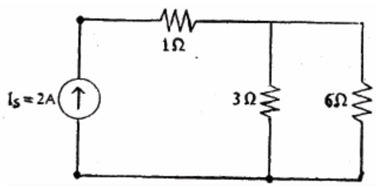
68.



In the circuit given above, I = 1A for I_S = 0. What is the value of I for I_S = 2?

a. 7 A
b. 4 A
c. 3 A
d. 2 A

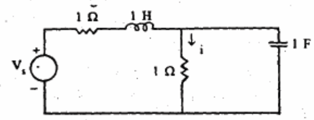
71.



For the circuit shown above, what is the voltage across the current source I_s?

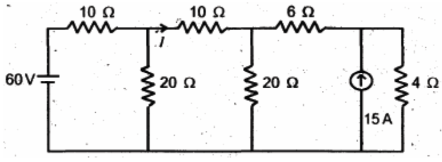
a. 0
b. 2 V
c. 3 V
d. 6 V

115. If $i = -10e^{-2t}$, the voltage of the source of the given circuit, V_s is given by



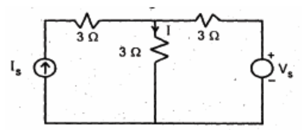
a. $-10e^{-2t}$
b. $-20e^{-2t}$
c. $20e^{-2t}$
d. $-30e^{-2t}$

115. Consider the following circuit:



What is the current I in the above circuit?

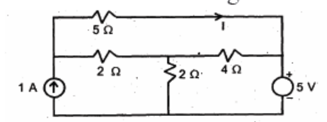
a. 0 A
b. 2 A
c. 5 A
d. 6 A



In the above circuit, when $V_s = 3V$, $I = 4A$, what is the value of I when V_s = 12V?

a. 5 A
b. 10 A
c. 15 A
d. 20 A

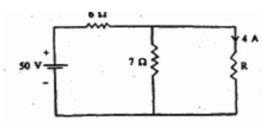
34. Consider the following circuit:



What is the value of current I in the 5Ω resistor in the above circuit?

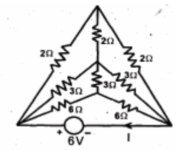
a. 0A
b. 2A
c. 3A
d. 4A

96. The value of resistance 'R' shown in the given figure is



a. 3.5Ω
b. 2.5Ω
c. 1Ω
d. 4.5Ω

37. Consider the following circuit:



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

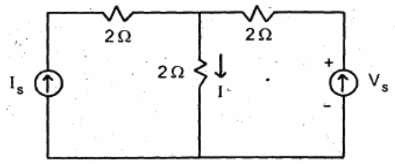
a. 1 A

b. 2 A

c. 3 A

d. 4 A

38.



For the circuit shown above, the value of V_S is 0 when I = 4 A. The value of I when V = 16 V, is

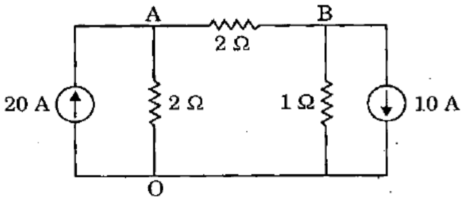
a. 6 A

b. 8 A

c. 10 A

d. 12 A

6.



Find the voltage of the node A with respect to 'O' for the circuit as shown.

(a) 40 V

(b) 20 V

(c) 50 V

(d) 60 V

Steady State A.C. Analysis

52. For a series RLC circuit energized with a sinusoidal voltage source of frequency 4 rad/s, the applied voltage lags the current by an angle of $\tan^{-1} 2$ degrees. Then the value of R for L = 1 H and C = 0·05 F is

(a) 4·0 ohm

(b) 2·0 ohm

(c) 1·0 ohm

(d) 0·5 ohm

48. The voltage applied to an R-L circuit at t = 0 when switch is closed is 100 cos (100 t + 30°). The circuit resistance is 80 Ω and inductance is 0·6 H (in which initial current is zero). What is the maximum amplitude of current flowing through the circuit ?

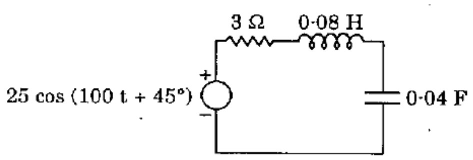
(a) 1 A

(b) 2 A

(c) 5 A

(d) 10 A

50.



What is the approximate steady state current in the above circuit ?

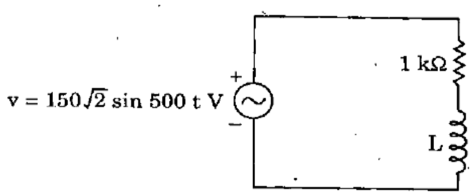
(a) 50 A

(b) 25 A

(c) 5 A

(d) 1 A

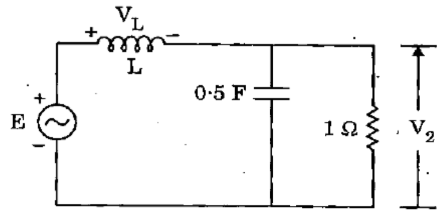
11.



For the AC circuit as shown above, if the rms voltage across the resistor is 120 V, what is the value of the inductor ?

(a) 0·5 H
(b) 0·6 H
(c) 1·0 H
(d) 1·5 H

41.



For the above given circuit, if supply frequency, ω = 2 rad/sec and $V_2 = 2 \angle 0°$ volts, then what is the lead angle of V_L with V_2 ?

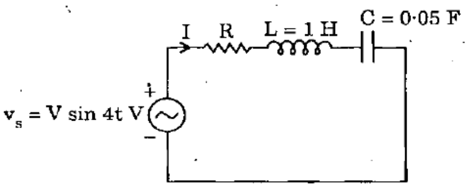
(a) 15°

(b) 45°

(c) 90°

(d) 135°

3.



For the circuit as shown above, if the current leads the applied voltage by $\tan^{-1} 2$, what is the resistance value in ohm ?

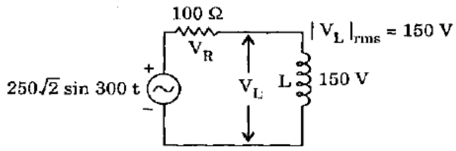
(a) 0·5

(b) 1·0

(c) 2·0

(d) 9·5

31.



Consider the following, with respect to the circuit as shown above :

1. $V_R = 100\sqrt{2}$ V
2. $|I|_{rms} = 2$ A
3. L = 0·25 H

Which of the above statements is/are correct ?

(a) 1 only

(b) 2 and 3

(c) 1 and 3

(d) 1 and 2

35. A network function $Z(s) = \dfrac{V(s)}{I(s)}$ has a single pole at $s = -\dfrac{1}{\sqrt{3}}$ and a single zero $s = -\sqrt{3}$. If the excitation v(t) = sin t, then what is the angle of lead or lag of the current ?

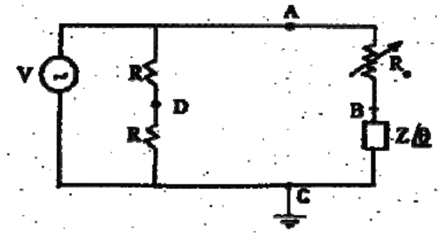
(a) Lead the voltage by 30°

(b) Lag the voltage by 30°

(c) Lead the voltage by 90°

(d) Lag the voltage by 90°

81. In the circuit shown in the figure, if R_0 is adjusted such that $V_{AB} = V_{BC}$, then



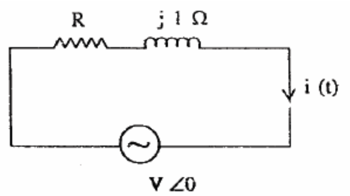
a. $\theta = 2\tan^{-1}\left(\dfrac{2|V_{BD}|}{|V|}\right)$

b. $|V_{BC}| = |V_{DC}|$

c. $|V_{AB}| = |V_{AD}|$

d. $\theta = \tan^{-1}\left(\dfrac{|V_{BD}|}{|V|}\right)$

82.



For the network shown above, if the current $i(t) = \sqrt{2}\sin(\omega t - 30°)$, then what is the value of R?

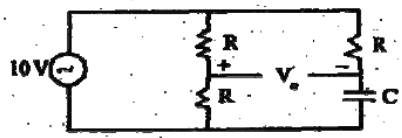
a. 1Ω

b. 3Ω

c. $\sqrt{3}\,\Omega$

d. $3\sqrt{3}\,\Omega$

96. In the circuit shown in the figure, output $|V_o(j\omega)|$ is



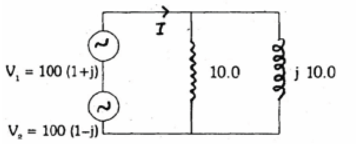
a. indeterminable as values of Rand C are not given

b. 2.5 V

c. $5\sqrt{2}$ V

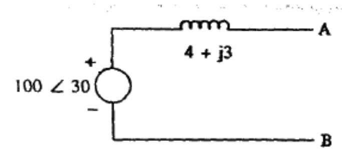
d. 5 V

58. The phase angle of the current 'I' with respect to the voltage V_1 in the circuit shown in the figure is:



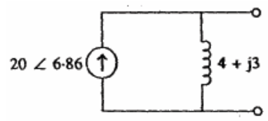
a. 0°
b. +45°
c. − 45°
d. − 90°

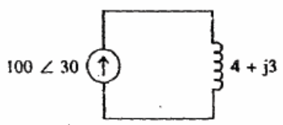
104.

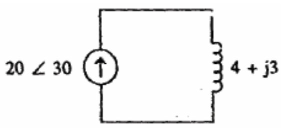


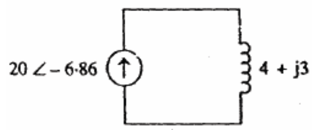
Voltage source is represented as shown in the figure given above.

What is the equivalent current source?

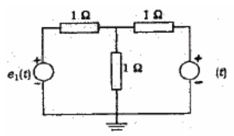
a.


b.


c.


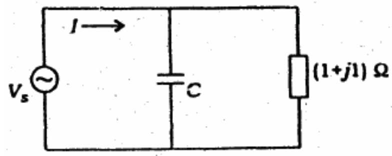
d.


92.



In the circuit shown in the above figure, $e_1(t) = \sqrt{3}\cos(\omega t + 30°)$ and $e_2(t) = \sqrt{3}$ /sin($\omega t + 60°$). What is the voltage v(t) across the 1Ω grounded resistor ?

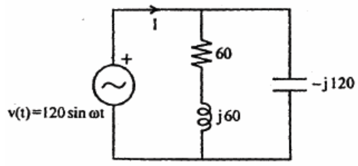
a. {cos ωt}V
b. {sin ($\omega t + 30^0$) + cos ($\omega t + 60°$)}V
c. {1∠90°)V
d. {j 1}V



In the circuit shown in the figure above, for what value of C will the current I be in phase with the sinusoidal source voltage $V_s = \sin 2t$?

a. $\frac{1}{4}F$
b. $\frac{1}{2}F$
c. $\frac{1}{\sqrt{2}}F$
d. 1 F

66.



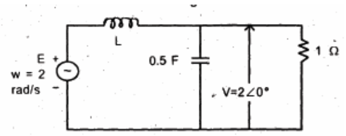
For the a.c. circuit given above, what is the value of I?

a. 1 + j1
b. 1 + j0
c. 2 − j1
d. 0 + j0

70. R and C are connected in parallel across a sinusoidal voltage source of 240 V. If the currents through the source and the capacitor are 5A and 4A, respectively, what is the value of R?

a. 24 Ω
b. 48 Ω
c. 80 Ω
d. 240 Ω

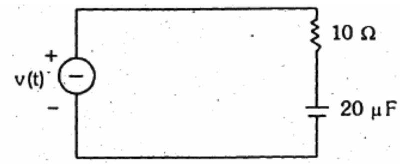
40. Consider the following circuit:



For the circuit shown above, by how much the voltage across the inductor leads the voltage across the capacitor?

a. 45°
b. 90°
c. 135°
d. 180°

44. In the given RC circuit, the current i(t) =2 cos 5000 t A.



The applied voltage v(t) is

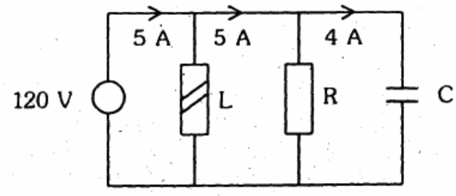
a. 28.28 cos (5000 t — 45°) V

b. 28.28 cos (5000 t + 45°) V

c. 28.28 sin (5000 t — 45°) V

d. 28.28 sin (5000 t + 45°) V

45. In the circuit shown in the given figure,



The current through the inductor L is

a. 0 A

b. 3 A

c. 4 A

d. 8 A

49. In an a.c. series RLC circuit, the voltage across R and L is 20 V, voltage across L and C is 9V and voltage across RLC is 15V. What is the voltage across C?

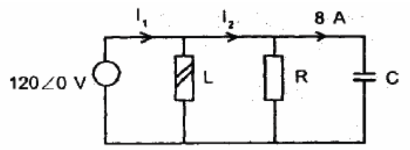
a. 7V

b. 12V

c. 16V

d. 21V

56.



In the above circuit, if $|I_1| = |I_2| = 10$ A

a. I_1 will lead by $\tan^{-1} 8/6$, I_2 will lag by $\tan^{-1} 8/6$

b. I_1 will lead by $\tan^{-1} 6/8$, I_2 will lag by $\tan^{-1} 6/8$

c. I_1 will lead by $\tan^{-1} 8/6$, I_2 will lag by $\tan^{-1} 8/6$

d. I_1 will lead by $\tan^{-1} 6/8$, I_2 will lag by $\tan^{-1} 6/8$

RMS and Average Value

49. A series R-C circuit with $R = 3\ \Omega$ and $X_C = 4\ \Omega$ at 50 Hz is supplied with a voltage $V = 50 + 141{\cdot}4 \sin 314\,t$. What is the RMS value of the current flowing through the circuit ?

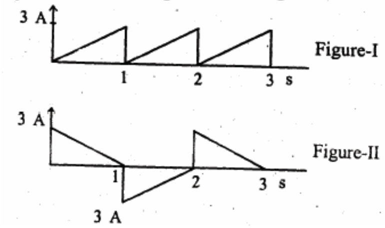
(a) 5 A

(b) 10 A

(c) 20 A

(d) 22·36 A

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



a. 2 : 1

b. 1 : 2

c. 1 : 1

d. $1:\sqrt{2}$

103. A particular current is made up of two components: a 10 A dc and a sinusoidal current of peak value of 14.14 A. The average value of the resultant current is

a. Zero

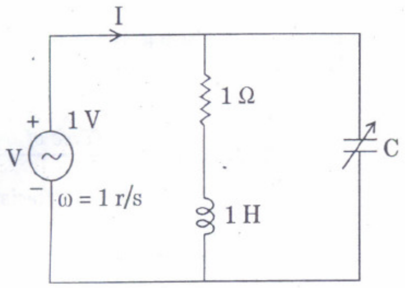
b. 24.14 A

c. 10A

d. 14.14A

Power in A.C. Circuits

88.



In the above circuit, the value of C for the circuit to exhibit a power factor of 0·86, is approximately

(a) 0·4 F

(b) 0·6 F

(c) 1·4 F

(d) 0·1 F

38. If the current flowing through a 20 ohm resistor is given as,
$i(t) = 4 + 5 \sin \omega t - 3 \cos 3 \omega t$ amp, then what is the power consumed by the resistor ?

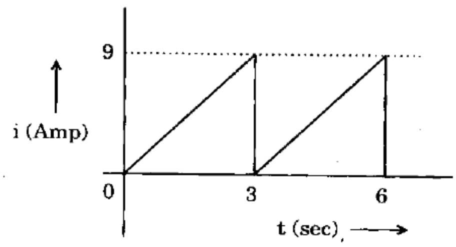
(a) 1000 W

(b) 660 W

(c) 500 W

(d) 180 W

95.



The current waveform as shown above, is applied in a pure resistor of 10 Ω. What is the power dissipated in the resistor ?

(a) 270 W

(b) 135 W

(c) 52 W

(d) 7 W

51. An arc source of 200 V rms supplies active power of 600 W and reactive power of 800 VAR. The rms current drawn from the source is

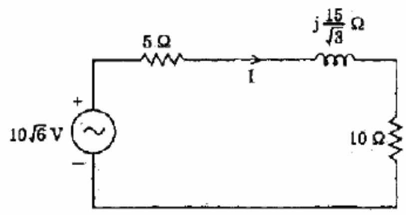
a. 10 A
b. 5 A
c. 3.75 A
d. 2.5 A

66. In a two element series network, the voltage and current respectively are given as, $v(t) = 50 \sin(314\,t) + 50 \sin(942\,t)$ V $i(t) = 10 \sin(314\,t + 60°) + 8 \sin(942t + 45°)$ A, then the power factor of the network is approximately:

a. 0.9
b. 0.6
c. 0.3
d. 0.1

48. Consider the following statements regarding the circuit shown in the figure. If the power consumed by 5 Ω is 10 W, then

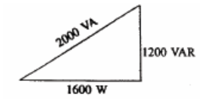
1. $|I| = \sqrt{2A}$
2. the total impedance of the circuit is 5W
3. $\cos\phi = 0.866$

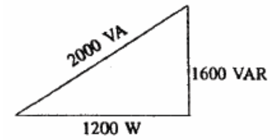


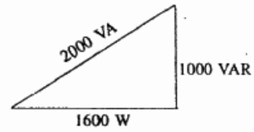
Which of these statements are correct?

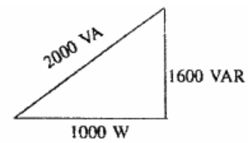
a. 1 and 3
b. 2 and 3
c. 1 and 2
d. 1, 2 and 3

81. A voltage of $V = 100\angle 30°$ is applied to an impedance $Z = 3 + j4$. Which one of the following is the power triangle?

a. 

b. 

c. 

d. 

Series Resonance

33. For the network function,

$T(s) = \dfrac{s}{s^2 + 2s + 100}$, the resonant frequency and bandwidth are respectively

(a) 10, 1

(b) 10, 2

(c) 100, 1

(d) 100, 2

28. If a series RLC circuit resonates at 1·5 kHz and consumes 100 watts from a 100 volts a.c. source operating at resonant frequency with a bandwidth of 0·75 kHz; the values of R, L and Q-factor of the circuit are respectively

(a) $100\ \Omega$; $\dfrac{0{\cdot}2}{3\pi}$ H; 2

(b) $50\ \Omega$; $\dfrac{0{\cdot}1}{2\pi}$ H; 4

(c) $100\ \Omega$; $\dfrac{2}{3\pi}$ H; 1

(d) $50\ \Omega$; $\dfrac{0{\cdot}3}{2\pi}$ H; 3

31. The resonant frequency of an RLC series circuit is 1·5 MHz with the resonating capacitor of 150 pF. The bandwidth is 10 kHz. The effective value of the resistor is

(a) 16·3 Ω

(b) 9·5 Ω

(c) 7·4 Ω

(d) 4·7 Ω

51. Consider the following statements regarding the properties of an R-L-C series circuit under resonance :

1. Current in the circuit is in phase with applied voltage.
2. Voltage drop across capacitor C and inductance L are equal in magnitude.
3. Voltage across the capacitor is equal in magnitude to the applied voltage.
4. Current in the circuit is maximum.

Which of the above statements is/are correct ?

(a) 1 only

(b) 1, 2 and 4

(c) 2 and 4

(d) 1, 3 and 4

36. A series resonant circuit has an inductive reactance of 1000Ω, a capacitive reactance of 1000 Ω and a resistance of 0.1 Ω. If the resonant frequency is 10 MHz, then the bandwidth of the circuit will be

a. 1 kHz
b. 10 kHz
c. 1 MHz
d. 0.1 kHz

36. A series RLC circuit, consisting of R = 10 ohms, X_L = 20 ohms and X_c = 20 ohms is connected across an ac supply of 100 V (rms). The magnitude and phase angle (with reference to supply voltage) of the voltage across the inductive coil are respectively

a. 100 V; 90°
b. 100 V; 900
c. 200 V; – 90°
d. 200 V; 90°

58. An RLC resonant circuit has a resonance frequency of 1.5 HMz and a bandwidth of 10 kHz. If C = 150 pF, then the effective resistance of the circuit will be

a. 29.5 Ω
b. 14.75 Ω
c. 9.4 Ω
d. 4.7 Ω

95. In a series R-L-C circuit, the maximum voltage across the capacitor occurs at a frequency

a. double the resonant frequency
b. equal to resonant frequency
c. $\sqrt{2}$ times the resonant frequency
d. below the resonant frequency

29. Assertion (A) : In a series R-L-C circuit, the current is a minimum at resonant frequency.
Reason (R) : The maximum voltage across the capacitor occurs at a frequency lower than the resonant frequency.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually 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

98. A series R-L-C circuit excited by a 100 V, variable frequency source, has a resistance of 10 Ω and an inductive reactance of 50Ω at 100 Hz. If the resonance frequency is 500 Hz, what is the voltage across the capacitor at resonance?

a. 100 V
b. 500V
c. 2500V
d. 5000 V

86. For a series RLC resonant circuit, what is the total reactance at the lower half power frequency?

a. $\sqrt{2}R\angle 45°$
b. $\sqrt{2}R\angle -45°$
c. R
d. - R

30. A series RLC circuit is excited by an ac voltage v(t) = 1 sin t. It L = 10H and C = 0.1 F, then the peak value of the voltage across R will be

a. 0.707
b. 1
c. 1.414
d. Indeterminate as the value R is not given

103. In an RLC series resonant circuit, if the maximum stored energy is increased by 10% and at the same time the energy dissipated per cycle is reduced by 10%, it will result in which one of the following ?

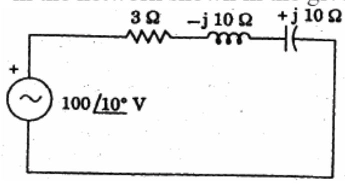
(a) An 11% decrease in quality factor

(b) An increase in the resonant frequency by 11%

(c) A 22% increase in quality factor

(d) A decrease in the resonant frequency by 22%

53. The reactive power drawn from the source in the network shown in the given figure is



a. 300 VAR
b. 200 VAR
c. 100 VAR
d. zero

50. Consider the following statements about the quality factor of a R - L - C circuit:

1. For the critically damped circuit, the quality factor Q = ½
2. Higher the value of quality factor higher will be the bandwidth of the circuit
3. Higher the value of quality factor lower will be the bandwidth of the circuit
4. For under damped circuits the value of Q is greater than ½

Which of these statements are correct?

a. 1 and 2
b. 1 and 3
c. 2 and 4
d. 1, 3 and 4

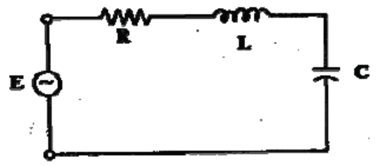
69. An RLC series circuit has a resistance R of 20 Ω and a current which lags behind the applied voltage by 45°. If the voltage across the inductor is twice the voltage across the capacitor, what is the value of inductive reactance?

a. 10 Ω
b. 20 Ω
c. 40 Ω
d. 240 Ω

48. At resonant frequency a R-L-C series circuit draws maximum current due to the reason that

a. the difference between capacitance reactance and inductance reactance is zero
b. the impedance is more than the resistance
c. the voltage across the capacitor equals the applied voltage
d. the power factor is less than unity

73.



Which one of the following statements is not correct for the circuit shown above at resonant frequency?

a. The current is maximum
b. The equivalent impedance is real
c. The inductive and capacitive reactances are equal in magnitude
d. The quality factor equals $\frac{1}{R}\sqrt{\frac{C}{L}}$

115. Assertion (A) : The current in a series R-L-C circuit driven by a sinusoidal voltage source may lead, lag or be in phase with the applied voltage.

Reason (R) : Series resonance does not imply unity power factor condition.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually 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

Parallel Resonance

26. For a parallel RLC circuit, if R = 40 Ω, L = 2 H and C = 0·5 F, the bandwidth and quality factor are respectively

(a) 20 rad/s, 0·05

(b) 10 rad/s, 20

(c) 20 rad/s, 10

(d) 0·05 rad/s, 20

4. Consider the following statements :

1. Power factor will be unity.
2. Current in circuit will be maximum.
3. Current in circuit will be minimum.

Which of these statements are correct with respect to resonance in R-L-C parallel circuit ?

(a) 1, 2 and 3

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1 and 3 only

6. Which of the following pair of values of L and C should be used in a tank circuit to obtain a resonant frequency of 8 kHz ? The bandwidth is 800 Hz and winding resistance of the coil is 10 ohms.

(a) 2 mH and 1 μF

(b) 10 H and 0·2 μF

(c) 1·99 mH and 0·2 μF

(d) 1·99 mH and 10 μF

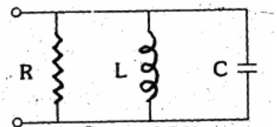
29. In a parallel RLC circuit, if L = 4H, C = 0.25 F and R = 40Ω, then the value of Q at resonance will be

a. 1
b. 10
c. 20
d. 40

46. For a parallel RLC resonant circuit; the damped frequency is $\sqrt{8}$ r/s and bandwidth is 2 r/s. What is its resonant frequency?

a. 2
b. $\sqrt{7}$
c. $\sqrt{10}$
d. 3

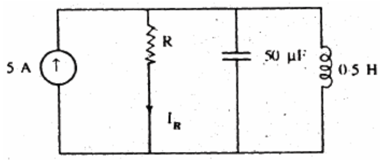
28. The circuit shown in the figure is to be scaled to an impedance level of 5kΩ and a resonant frequency of 5M rad/s. Which one .of the following is a correct set of element values for the scaled circuit?



R = 2.5Ω L = 0.5 H
C = 2 F

a. $2.5\Omega, 0.2\ mH, 200\ pF$
b. $5k\Omega, 0.2\ mH, 200\ \mu F$
c. $5k\Omega,\ 0.2\ mH, 200\ \mu F$
d. $5k\Omega, 0.1\ mH, 0.4\ \mu F$

49.



In the given circuit, at resonance, I_R in Amperes is equal to

a. 0
b. 10
c. 5
d. 0.5

80. A circuit has two parallel branches. In one branch, R and L are connected in series while in the other; R and C are connected in series. If R = $\sqrt{L/C}$, which one of the following is not correct?

a. The circuit is in resonance
b. The two branch currents are in quadrature
c. The circuit has an impedance independent of its frequency
d. The two branch currents are in phase

80. A lossy capacitor is represented by an ideal capacitor C with a high resistance R in parallel. What is the Q of the circuit at frequency ω?

a. ωCR

b. 1/(ωCR)

c. ωC/R

d. R/(ωC)

77. **Assertion (A):** Power factor is defined as the ratio of apparent power to the average power in an a.c. circuit.

Reason (R): The magnitude of power factor is always less than unity.

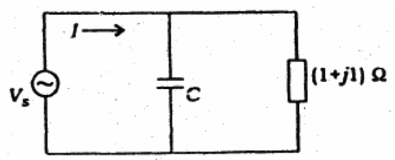
82. Which one of the following relations for power is not correct?

a. P = $VI \cos\theta$

b. P = Re part of [VI*]

c. P = Re part of [V*I]

d. P = $VI \sin\phi$



In the circuit shown in the figure above, for what value of C will the current I be in phase with the sinusoidal source voltage $V_s = \sin 2t$?

a. $\frac{1}{4}F$

b. $\frac{1}{2}F$

c. $\frac{1}{\sqrt{2}}F$

d. 1 F

51. A 10 mH inductor carries a sinusoidal current of 1 A r.m.s. at a frequency of 50 Hz. The average power dissipated by the inductor is

a. 0 W

b. 0.25 W

c. 0.5 W

d. 1.0 W

71. A parallel circuit consists of two branches : one with a pure capacitor and the other has resistor of 5 Ω in series with a variable inductor. To this circuit an ac voltage of fixed value and frequency is connected. The circuit will exhibit two resonances if :

a. The reactance of the capacitor is less than 10 Ω

b. The reactance of the capacitor is greater than 10 Ω

c. The reactance of the capacitor equals 10 Ω

d. The capacitor is removed by a short circuit

74. A parallel circuit has two branches. In one branch, R and L are in series and in the other branch, R and C are in series. The circuit will exhibit unity power factor when :

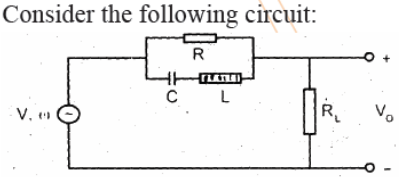
a. $R = \sqrt{\frac{L}{C}}$

b. $R = \sqrt{LC}$

c. $R = \sqrt{\frac{C}{L}}$

d. $R = \frac{L}{C}$

39. Consider the following circuit:



For the above circuit, which one of the following statements is correct? The voltage V_o is independent of R, if the input signal frequency ω is

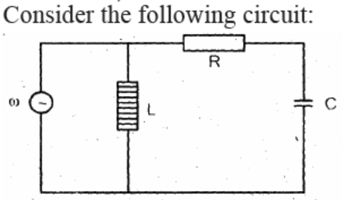
a. $1/\sqrt{LC}$

b. $1/\left[2\sqrt{LC}\right]$

c. $\sqrt{LC}$

d. Has any value

40. Consider the following circuit:



For what value of ω, the circuit shown above exhibits unity power factor?

a. $\frac{1}{\sqrt{LC}}$

b. $\frac{1}{\left[\sqrt{LC - R^2C^2}\right]}$

c. $\frac{1}{\left[\sqrt{LC + R^2C^2}\right]}$

d. $\frac{1}{RC}$

46. A parallel circuit consists of two branches. One branch has R_L and L connected in series and the other branch has R_C and C connected in series. Consider the following statements:

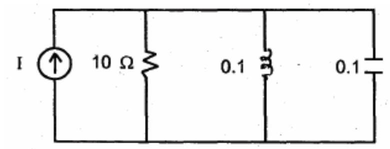
1. The two branch currents will be in quadrature if $R_L R_C = L/C$
2. The impedance of the whole circuit is independent of frequency, if $R_L = R_C$ and $\omega = 1/\sqrt{LC}$
3. The circuit is in resonance for all the frequencies if $R_L = R_C$

a. The two branch currents will be n phase at $\omega = 1/\sqrt{LC}$

Which of the above statements are correct?

b. 1 and 2
c. 2 and 3
d. 1 and 3
e. 3 and 4

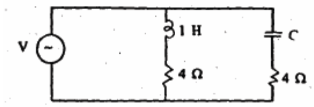
48. Consider the following circuit:



For the above circuit, the current source is sinusoidal with frequency equal to the resonant frequency of the circuit. What is the value of current through the resistor?

a. 0
b. 0.1 I
c. I
d. 10 I

118. The value of the capacitance 'C' in the given ac circuit to make it a constant resistance circuit OR for the supply current to be independent of its frequency is

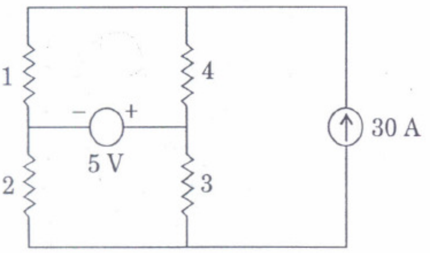


a. 1/16 F
b. 1/12 F
c. 1/8 F
d. 1/4 F

Network Theorems

Superposition Theorem

22.



The power dissipated in the 1 Ω resistor is 1 W due to the 5 V voltage source alone and 576 W due to 30 A current source alone. The total power absorbed in the same resistor due to both the sources is

(a) 577 W

(b) 575 W

(c) 625 W

(d) 529 W

76. **Assertion (A):** In a linear network, the superposition theorem can be used to calculate power dissipation in a resistive branch of the network.

Reason (R): Superposition theorem is valid for currents and voltages, and therefore is valid also for power dissipation.

113. Assertion (A) : Superposition theorem is used to particular branch in a linear network calculate the current in a of each of the independent sources, by considering the effect taken one-at a time.

Reason (R) : In a linear network, the behaviour of the circuit does not vary depending upon the source.

62. Consider the following statements :

Superposition theorem is applicable to a linear network in determining

1. the current responses.
2. the voltage responses.
3. the power responses.

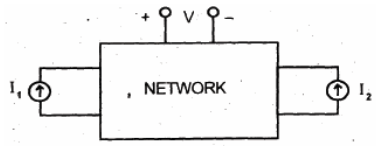
Which of the statements given above are correct?

a. 1 and 2
b. 1, 2 and 3
c. 1 and 3
d. 2 and 3

55. If a network has all linear elements except for a few nonlinear ones, then superimpositions theorem

a. cannot hold at all
b. always holds
c. may hold on careful selection of element values, source waveform and response
d. holds in case of direct current excitations

39.



The linear network as shown above has only resistors. If I_1 8 A and I_2 = 12 A; V is found to be 80 V. V = 0 when I_1 = –8 A and I_2 = 4 A. Then the value of V when I_1 = I_2 = 10 A, is

a. 25 V
b. 50 V
c. 75 V
d. 100 V

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

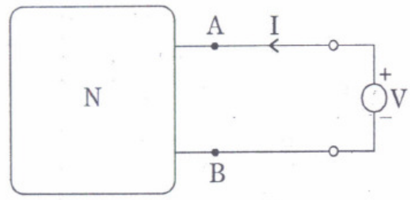
a. $P_1 \pm P_2$
b. $\sqrt{P_1} \pm \sqrt{P_2}$
c. $\left(\sqrt{P_1} \pm \sqrt{P_2}\right)^2$
d. $\left(P_1 \pm P_2\right)^2$

24. A certain network consists of two ideal voltage sources and a large number of ideal resistors. The power consumed in one of the resistors is 4W when either of the two sources is active and the other is replaced by a short circuit .The power consumed by the same resistor when both the sources are simultaneously active would be

a. Zero or 16 W
b. 4 W or 8 W
c. Zero or 8 W
d. 8 W or 16 W

Thevinins Theorem

65.



For the network shown above $I = (0{\cdot}2\,V - 2)$ A, (I = the current delivered by the voltage source V). The Thevenin voltage V_{th} and resistance R_{th} for the network N across the terminals AB are respectively

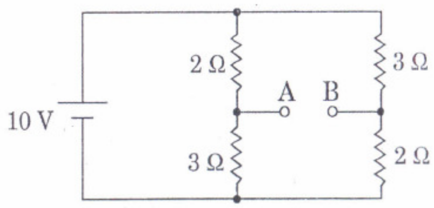
(a) -10 V, 5 Ω

(b) 10 V, 5 Ω

(c) -10 V, 0·2 Ω

(d) 10 V, 0·2 Ω

69.



Thevenin equivalent voltage V_{AB} and resistance R_t across the terminals AB in the above circuit are

(a) 6 V, 5 Ω

(b) 4 V, 5 Ω

(c) 2 V, 2·4 Ω

(d) 2 V, 2·5 Ω

98. A battery charger can drive a current of 5 A into a lohm resistance connected at its output terminals. If it is able to charge an ideal 2V battery at 7A rate, then its Thevenin's equivalent will be

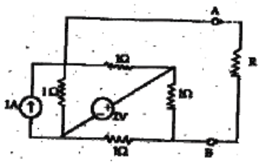
a. 7.5 V in series with 0.5 ohm

b. 12.5 V in series with 1.5 ohms

c. 7.5 V in parallel with 0.5 ohm

d. 12.5 V in parallel with 1.5 ohms

79. If a resistance 'R' of 1Ω is connected across the terminals AB as shown in the given figure, then the current flowing through R will be



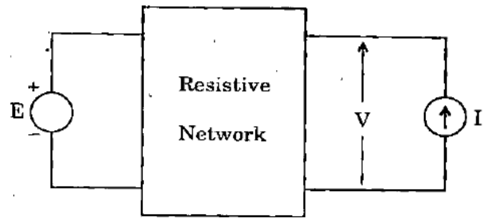
a. 1A

b. 0.5A

c. 0.25 A

d. 0.125 A

87.



In the above shown circuit, if V = 3 volts for E = 1 volt, I = 0; and V = 2 volts for I = 2 A and E = 0. When E = 1 volt and I is replaced by a resistor of 2 ohm, then what is the value of V ?

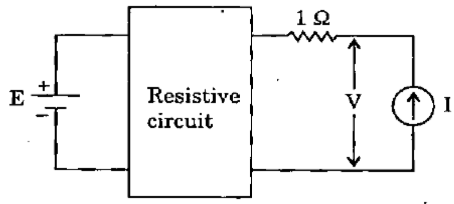
(a) 2 volts

(b) 4 volts

(c) 6 volts

(d) 8 volts

20.



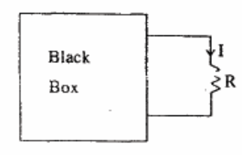
For the circuit as shown above, if $E = E_1$ and I is removed, then V = 5 volts. If E = 0 and I = 1 A, then V = 5 volts. For $E = E_1$ and I replaced by a resistor of 5 Ω, what is the value of V in volts ?

(a) 5·0

(b) 2·5

(c) 7·5

(d) 3·5



For circuit shown above, the black box contains resistors and independent sources only. The current I is 3 A and 1.5 A for R = 0 and 2Ω, respectively. For R = 1Ω, what is the current I?

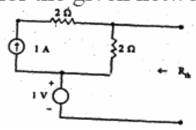
a. 1A

b. 2A

c. 3A

d. 4A

100. The Thevenin's equivalent resistance R_{th} for the given network is



a. 1Ω
b. 2Ω
c. 4Ω
d. Infinity

86. Which of the following statements are associated with Thevenin's theorem?

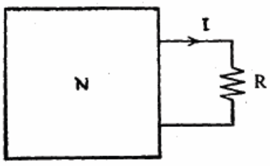
1. Impedance through which current is required is removed and open-circuit voltage is found
2. It is applicable to only d.c. circuits
3. The network is replaced by a voltage source and a series impedance remains after removing the load impedance.

Select the correct answer using the code given below:

Code:

a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. 1, 2 and 3

69.



The black-box, N contains resistors and independent sources. If I = 3A and 1.5A for R = 0 and 2Ω, respectively, then what is the value of I for R = 1Ω?

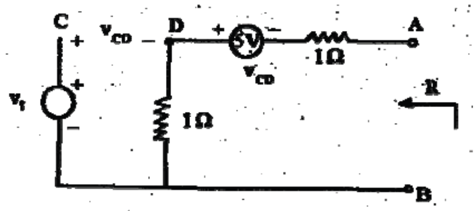
a. 1 A

b. 2 A

c. 3 A

d. 4 A

83. The resistance 'R' looking into the terminals AB in the circuit shown in the figure will be



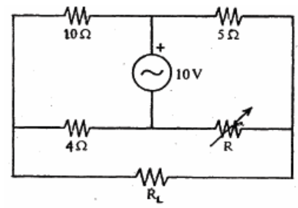
a. 0.5Ω

b. 2Ω

c. 3Ω

d. 7Ω

70.



For the circuit shown above, sthe value of R is adjusted, so as to make the current in R_L equal to zero. What is the

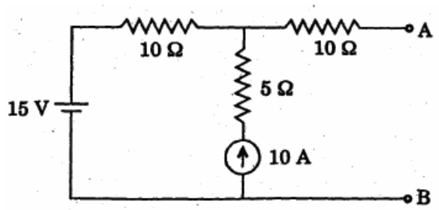
a. 1 Ω

b. 2 Ω

c. 3 Ω

d. 4 Ω

49. In the network shown in the given figure, the Thevenin source and the impedance across terminals A — B will be respectively



a. 15V and 13.33 Ω

b. 50 V and 15 Ω

c. 115 V and 20 Ω

d. 100 V and 25 Ω

23. The Thevenin equivalent of the network shown in Fig. I is 10 V in series with a resistance of 2Ω. If now, a resistance of 3Ω is connected across AB as shown in Fig. II, the Thevenin equivalent of the modified network across AB will be

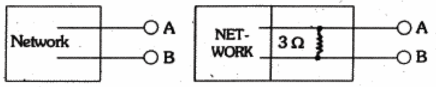
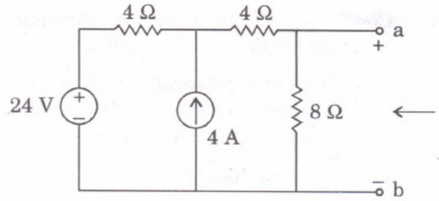


Fig. I Fig. II

a. 10 V in series with $1.2\,\Omega$ resistance
b. 6 V in series with $1.2\,\Omega$ resistance
c. 10 V in series with $5\,\Omega$ resistance
d. 6 V in series with $5\,\Omega$ resistance

Nortons Theorem

70.



Applying Norton's Theorem, the Norton's equivalent circuit to the left of the terminals a and b in the above circuit is having equivalent current source (I_N) and equivalent resistance (R_N) as

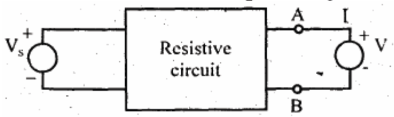
(a) $I_N = 5$ A; $R_N = 4\ \Omega$

(b) $I_N = 4$ A; $R_N = 6\ \Omega$

(c) $I_N = 9$ A; $R_N = 1{\cdot}6\ \Omega$

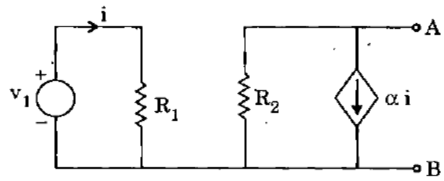
(d) $I_N = 4$ A; $R_N = 3\ \Omega$

40. For the network shown in the figure, if V = V_1 and V = 0, then = -5 A and if V = 0, and V_1 = 1, then I = 1/2 A. The values of I_{sc} and R_1 of the Norton's equivalent across AB would he respectively.



a. -5 A and 2Ω
b. 10 A and $0.5\ \Omega$
c. 5 A and $2\ \Omega$
d. 2.5 A and $5\ \Omega$

71.



For the circuit as shown above, what are the values of the Norton's equivalent current and conductance between AB terminals ?

(a) $-\alpha\dfrac{V_1}{R_1}$ and $G = \dfrac{1}{R_2}$

(b) $\alpha\dfrac{V_1}{R_2}$ and $G = \dfrac{1}{R_1}$

(c) $\alpha\dfrac{V_1}{R_1}$ and $G = \dfrac{1}{R_2}$

(d) $-\alpha\dfrac{V_1}{R_1}$ and $G = -\dfrac{1}{R_1}$

85. Match List I and List II and select the correct answer using the code given below the lists:

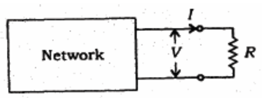
List-I
(Theorem/Law)
A. Norton's theorem
B. Superposition theorem
C. Thevenin's theorem
D. Kirchhoff's current law

List II
(Property)
1. Effect of independent sources in a linear circuit are additive
2. Law of non-accumulation of change holds good at nodes
3. Current source with shunt resistor
4. Voltage source with series resistor

Code:

	A	B	C	D
a.	2	4	1	3
b.	3	1	4	2
c.	2	1	4	3
d.	3	4	1	2

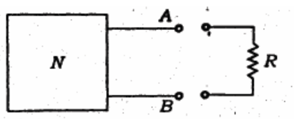
93.



For the network shown as above, when I = 0, V = 20 V and when R = 0,I = 10A. If now R = 3 Ω, what is the value of the current I ?

a. 6.67 A
b. 6.0 A
c. 4.0 A
d. 10 A

94.



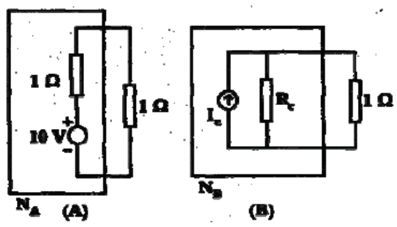
Norton equivalent to the network N to the left of AB is a cu rent source 1_N = 4 A from B to A, $R_N = 2\Omega$. The current through R when it is connected across AB = 2A. What is the value of resistance R?

a. 1Ω
b. 2Ω
c. 3Ω
d. 4Ω

63. If two identical 3 A, 4 Ω Norton equivalent circuits are connected in parallel with like polarity the combined Norton equivalent circuit will be:

a. 3A, 8Ω
b. 6A, 8Ω
c. 0A, 2Ω
d. 6A, 2Ω

64.



Consider the following statements:

Network N_A in figure (A) can be replaced by the network N_B shown in figure (B) above, when I_C and R_C, respectively, are :

1. 5 A and 2 Ω
2. 10 A and 1Ω
3. 15 A and $\frac{1}{2}$ Ω
4. 30 A and $\frac{1}{5}$ Ω

Which of the following statements given above is/are correct?

a. 1 only
b. 2, 3 and 4
c. 1, 2, 3 and 4
d. 2 and 3

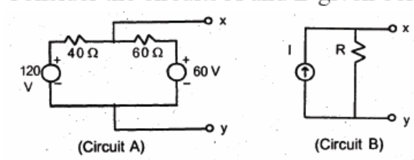
66. Consider the following properties of a particular network theorem :

1. The theorem is not concerned with type of elements.
2. The theorem is only based on the two Kirchoff's laws.
3. The reference directions of the branch voltages and currents are arbitrary except that they have to satisfy Kirchoff's laws.

Which one of the following theorems has the above characteristics?

a. Thevenin's theorem
b. Tellegen's theorem
c. Norton's theorem
d. Superposition theorem

36. Consider the circuits A and B given below:



For what values respectively of I and R, the circuit B is equivalent to circuit A?

a. 3A, 40Ω
b. 4A, 24Ω
c. 1A,60Ω
d. 2A,100Ω

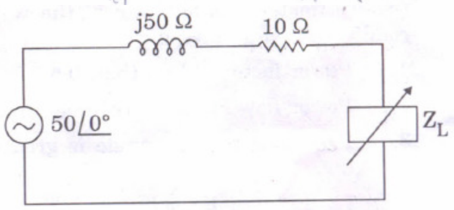
Maximum Power Transfer Theorem

66. A load is connected to an active network. At the terminals to which the load is connected, R_{th} = 10 Ω and V_{th} = 60 V. Then the maximum power supplied to the load is

(a) 360 W
(b) 90 W
(c) 60 W
(d) 10 W

60×60 $P = V^2 R$ $V = IR$ $I = V/R$ $360W$ I^2R $\frac{V^2}{R^2} R$ $\frac{V^2}{R}$

78.



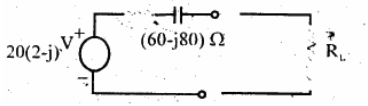
The maximum power that can be transferred in the load Z_L in the above circuit is

(a) 12·25 W
(b) 62·5 W
(c) 24·5 W
(d) 500 W

43. A human nerve cell has an open circuit voltage of 80 mV and it can deliver a current of 5 nA through a 6 M ohm load. What is the maximum power available from the cell ?

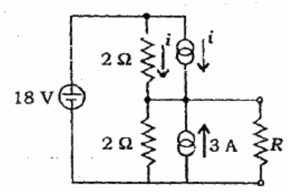
(a) 0·16 nW
(b) 16 mW
(c) 1·6 W
(d) 16 pW

42. The Thevenin equivalent of a network is as shown in the given figure. For maximum power transfer of the variable and purely resistive load R_1, its resistance should be



a. 60 Ω
b. 80 Ω
c. 100 Ω
d. infinity

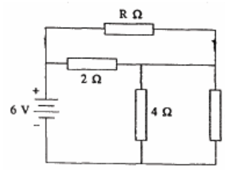
84.



What is the appropriate load resistor that draws maximum power from the source in the circuit given above?

a. (5/6) Ω
b. (1/3) Ω
c. (2/3) Ω
d. None of the above

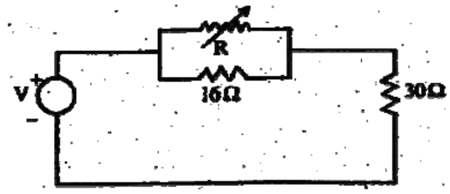
72.



In the circuit shown above, when is the power absorbed by the 1 Ω resistor maximum?

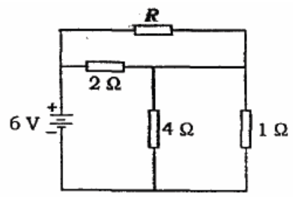
a. R = 0
b. R = 2 Ω
c. R = 4 Ω
d. R = ∞

92. In the circuit shown in the figure, the power dissipated in 30Ω resistor will be maximum if the value of R is



a. 30Ω
b. 16Ω
c. 9 Ω
d. zero

5.



In the circuit show above, when is the power absorbed by the 4 Ω resistor maximum?

a. R = 0
b. R = 2 Ω
c. R = 4 Ω
d. R = ∞

37. From a sinusoidal voltage source V_s of impedance $Z_s = R_s + jX_s$, power is drawn by a load $Z_L = R_L + jX_L$. The condition for maximum power in Z_L is given in List – II for the constraints shown in List – I. Match List - I with List - II and select the correct answer using the codes given below the Lists:

List I

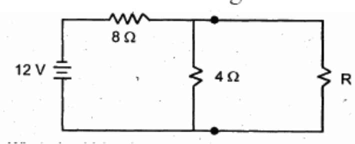
A. X_s = zero
B. X_L = zero
C. R_L fixed
D. X_L fixed

List II

1. $Z_L^2 = R_S^2 + X_s^2$
2. $Z_L = R_L - jX_s$
3. $Z_L = R_s - jX_s$
4. $Z_L = R_s$
5. $Z_L = R_S^2 + \left[\left(X_s + X_L\right)^2\right]^{1/2} + jX_L$

	A	B	C	D
a.	4	1	2	3
b.	2	3	4	5
c.	4	1	2	5
d.	1	3	4	5

38. Consider the following circuit:



What should be the value of resistance R, in the above circuit if it has to absorb the maximum power from the source?

a. 8/3 ohms
b. 3/8 ohms
c. 4 ohms
d. 8 ohms

114. Assertion (A) : Maximum power transfer from a source with complex internal impedance to a complex load will occur if the source impedance is same as the load impedance.

Reason (R) : The efficiency of maximum power transfer cannot exceed 50%.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually 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

35. A voltage source having an internal impedance of 8 + j6 ohms supplies power to a resistive load. What should be the load resistance for maximum power transferred to it?

a. 8 ohms
b. 6 ohms
c. 10 ohms
d. $\sqrt{10}$ ohms

Reciprocity Theorem

74.

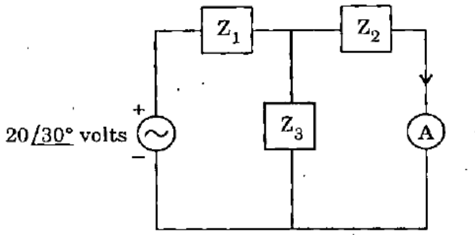


Fig. (a)

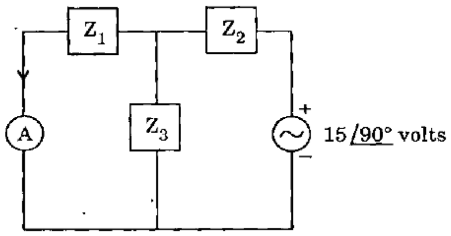


Fig. (b)

For the circuit as shown in Fig. (a), the current through the ammeter is $4\angle -45°$ Amps. What is the current in the ammeter for the circuit in Fig. (b) ?

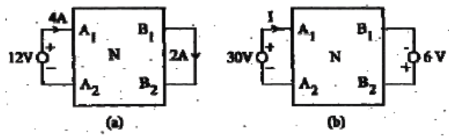
(a) $3\angle 15°$ Amps

(b) $2\angle 30°$ Amps

(c) $4\angle 45°$ Amps

(d) $5\angle -90°$ Amps

61.



The terminal volt-ampere conditions of a linear reciprocal network N are shown in the figure (a). What is the current I corresponding to the terminal conditions shown in the figure (b)?

a. - 1A

b. 9A

c. 10 A

d. 11 A

45. In a balanced Wheatstone bridge, if the positions of detector and source are interchanged, the bridge will still remain balanced. This inference can be drawn from

a. reciprocity theorem

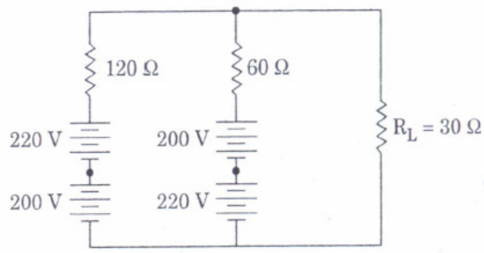
b. duality principle

c. compensation theorem

d. equivalent theorem

Millmans theorem

75.



In the circuit shown above, the current through R_L is

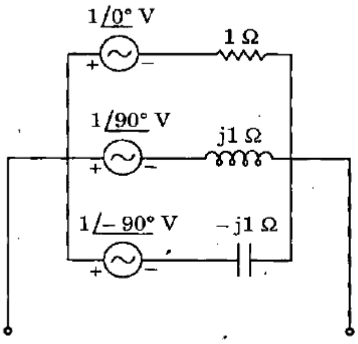
(a) 6 A

(b) 4 A

(c) 2 A

(d) 0

18.



Replace the above shown circuit by a single voltage source in series with an impedance.

(a) 2 V, 1 Ω

(b) 1 V, 3 Ω

(c) 3 V, 1 Ω

(d) 2 V, 3 Ω

32. Five cells are connected in series in a row and then four such rows are connected in parallel to feed the current to a resistive load of 1.25Ω. Each cell has emf of 1.5 V with internal resistance of 0.2Ω. The current through the load will be

a. 3.33 A
b. 23.33A
c. 5A
d. 1 A

67. Match List I (Property of Network) with List II (Relevant Theorem) and select the correct answer using the code given below the Lists:

List I

A. Linearity
B. Structure
C. Equivalent Circuit
D. Bilateral

List II

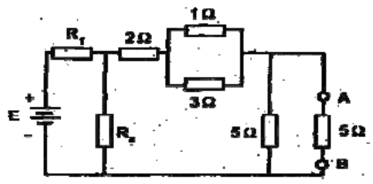
1. Super position Theorem
2. Norton's Theorem
3. Tellengen's Theorem
4. Reciprocity Theorem
5. Millman's Theorem

Codes;

	A	B	C	D
a.	2	5	1	3
b.	1	3	2	4
c.	2	3	1	4
d.	1	5	2	3

Substitution Theorem

53.



In the circuit shown above, the voltage across 2Ω resistor is 20 V. The 5Ω resistor connected between the terminals A and B can be replaced by an ideal

a. Voltage source of 25 V with + terminal upward
b. Voltage source of 25 V with + terminal downward
c. Current source of 2 A upward
d. Current source of 2 A downward

Tellegens Theorem

78. It is required to find the current through a particular branch of a linear bilateral network without mutual coupling when the branch impedance takes four different values. Which one of the following methods will be preferred ?

(a) Mesh analysis

(b) Thevenin's equivalent circuit

(c) Nodal analysis

(d) Superposition theorem

55. Which of the following terms can be applied to any network - linear or non-linear, active or passive, time-variant or time- invariant?

a. Thevenin theorem
b. Norton theorem
c. Tellegen theorem
d. Superposition theorem

Two Port Network Parameters

Z-Parameters

14. A two-port network is defined by the relation :

$$I_1 = 5\,V_1 + 3\,V_2$$

$$I_2 = 2\,V_1 - 7\,V_2$$

The value of Z_{12} is

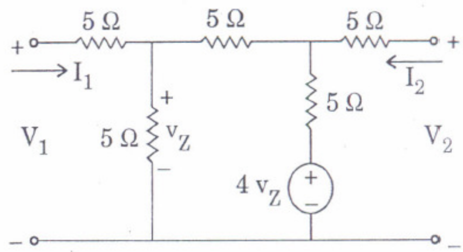
(a) 3

(b) -3

(c) $\frac{3}{41}$

(d) $\frac{2}{31}$

98.



With reference to the above network the value of Z_{11} will be

(a) -3

(b) 3

(c) -1

(d) -5

17. Consider the following statements for a symmetrical T section :

1. Z_{11} and Z_{22} are equal.
2. Z_{12} and Z_{21} are equal.
3. Z_{11} and Z_{12} are equal.
4. Z_{21} and Z_{22} are equal.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 3 and 4 only

(d) 1, 2, 3 and 4

68. A reciprocal two-port network is symmetrical if

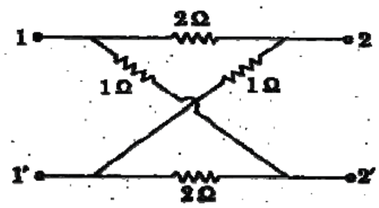
a. $\Delta A = 1$

b. $A = C$

c. $z_{11} = z_{22}$

d. $\Delta y = 1$

64.



What is the value of z_{21} for the network shown above?

a. - 2 Ω

b. - 1/2 Ω

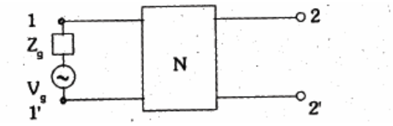
c. 1 Ω

d. 2 Ω

31. Two two-port network shown in the figure is characterized by the impedance parameters Z_{11}. Z_{12}. Z_{21} and Z_{22}. for the equivalent Thevenin's source looking to

Two Port Network Parameters

the left of port 2, the V_T and Z_T will be respectively



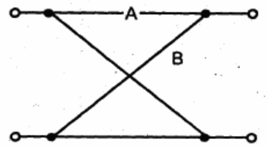
a. $V_T = \dfrac{Z_{11}}{Z_{11}+Z_g} V_g; Z_T = Z_{22} - Z_{12}$

b. $V_T = \dfrac{Z_{12}}{Z_{11}+Z_g} V_g; Z_T = Z_{22} - Z_{12}$

c. $V_T = \dfrac{Z_{21}V_g}{Z_{11}+Z_g}; Z_T = Z_{22} - \dfrac{Z_{12}Z_{21}}{Z_{11}+Z_g}$

d. $V_T = \dfrac{Z_{12}V_g}{Z_{11}+Z_g}; Z_T = Z_{22} - \dfrac{Z_{12}Z_{21}}{Z_{11}+Z_g}$

47.



The lattice circuit has the following impedances $Z_A = 3 + j4$, $Z_B = 3 - j4$. Then the Z-parameters would be

a. $\begin{pmatrix} 3+j4 & 0 \\ 0 & 3-j4 \end{pmatrix}$

b. $\begin{pmatrix} 3 & -j4 \\ -j4 & 3 \end{pmatrix}$

c. $\begin{pmatrix} 3+j4 & 3 \\ 3 & 3+j4 \end{pmatrix}$

d. $\begin{pmatrix} -j4 & 3 \\ 3 & +j4 \end{pmatrix}$

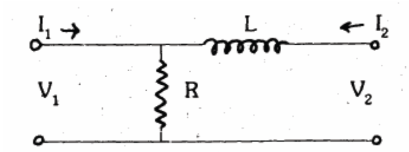
46. Match List - I with List - II for the two-port network shown in the given figure and select the correct answer.

List I

A. Z_{11}
B. Z_{12}
C. Z_{21}
D. Z_{22}

List II

1. R
2. R+L
3. R-Ls
4. R+Ls



	A	B	C	D
a.	1	2	1	4
b.	2	1	1	3
c.	1	1	1	4
d.	2	1	3	4

30. In a passive two-port network, the open-circuit impedance matrix is

$$\begin{bmatrix} 10\,\Omega & 2\,\Omega \\ 5\,\Omega & 5\,\Omega \end{bmatrix}$$

If the input port is interchanged with the output port, then the open-circuit impedance matrix will be

a. $\begin{bmatrix} 10\,\Omega & 2\,\Omega \\ 5\,\Omega & 5\,\Omega \end{bmatrix}$

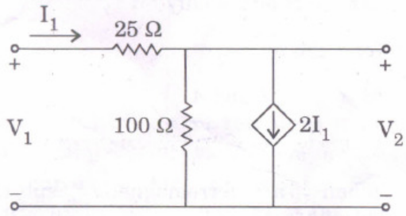
b. $\begin{bmatrix} 5\,\Omega & 2\,\Omega \\ 2\,\Omega & 10\,\Omega \end{bmatrix}$

c. $\begin{bmatrix} 5\,\Omega & 10\,\Omega \\ 2\,\Omega & 2\,\Omega \end{bmatrix}$

d. $\begin{bmatrix} 2\,\Omega & 5\,\Omega \\ 10\,\Omega & 2\,\Omega \end{bmatrix}$

Y-Parameters

17.



The Y-parameters of the network shown above are

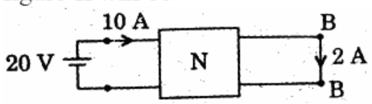
(a) $\begin{bmatrix} -0{\cdot}04 & 0{\cdot}04 \\ -0{\cdot}04 & 0{\cdot}03 \end{bmatrix}$

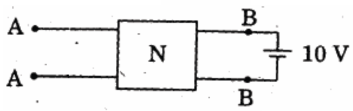
(b) $\begin{bmatrix} 0{\cdot}04 & -0{\cdot}04 \\ 0{\cdot}04 & -0{\cdot}03 \end{bmatrix}$

(c) $\begin{bmatrix} 0{\cdot}04 & -0{\cdot}03 \\ -0{\cdot}04 & 0{\cdot}03 \end{bmatrix}$

(d) $\begin{bmatrix} -0{\cdot}04 & 0{\cdot}03 \\ 0{\cdot}04 & 0{\cdot}03 \end{bmatrix}$

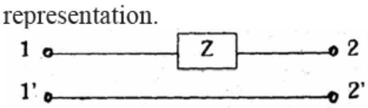
29. The short-circuit test of a 2-port network is shown in figure-I. The voltage across the terminals AA in the network shown in figure-II will be



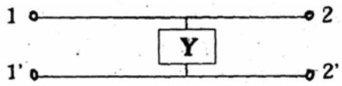


a. 20V
b. 10V
c. 5V
d. 2V

45. Consider the following statements:
1. The two-port network shown below does NOT have an impedance matrix representation.



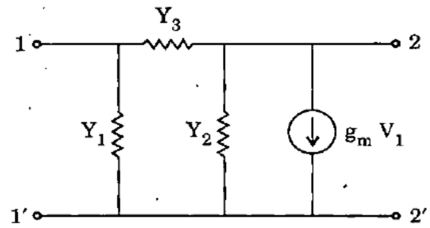
2. The following two-port network does NOT have an admittance matrix representation



3. A two-port network is said to be reciprocal if it satisfies $z_{12} = z_{21}$

Of these statements
a. 1 and 2 are correct
b. 1, 2 and 3 are correct
c. 1 and 3 are correct
d. None is correct

60.



For the z-port network as shown above, what is the value of Y_{21} parameter ?

(a) $Y_1 + Y_3$

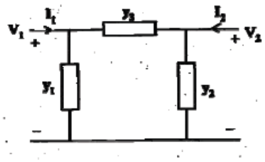
(b) $g_m - Y_2$

(c) $g_m - Y_3$

(d) $Y_1 + Y_2 + g_m$

67. A two port network has $z_{11} = 11/35$, $z_{12} = z_{21} = 2/35$, $z_{22} = 3/35$. Its y_{11} and y_{12} parameter will, respectively, be
a. 3, -2
b. 3, 2
c. 13, -2
d. 13, 2

69.



Equivalent π network

The currents I_1 and I_2 at the output of 2-port network can be written as

$I_1 = 5V_1 - V_2$

$I_2 = -V_1 + V_2$

Which one of the following gives the parameters of an equivalent π network shown above?

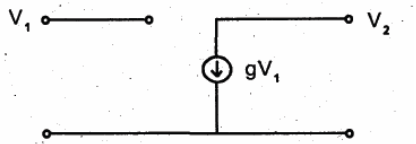
a. $y_1 = 4\mho, y_2 = 0, y_3 = 1\mho$

b. $y_1 = 4\mho, y_2 = 4\mho, y_3 = 1\mho$

c. $y_1 = 1\mho, y_2 = 1\mho, y_3 = 1\mho$

d. $y_1 = 4\mho, y_2 = 0, y_3 = 2\mho$

108. The 2-port network shown in the circuit given below is connected in parallel with another 2-port network which has $y_{11} = -y_{12} = -y_{21} = y_{22} = Y$



The y-parameters of the composite network will satisfy which one of the following?

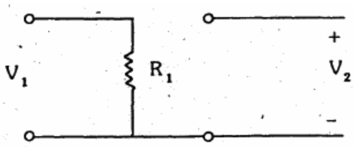
a. $y_{11} = Y + g$

b. $y_{12} = -Y + g$

c. $y_{21} = -Y + g$

d. $y_{22} = Y + g$

39.



The (y) parameters of the network given in Fig. 1 are given by

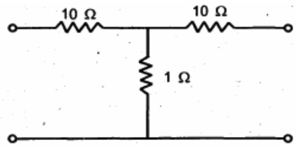
a. $\begin{bmatrix} R_1^{-1} & R_1^{-1} \\ R_1^{-1} & R_1^{-1} \end{bmatrix}$

b. $\begin{bmatrix} 0 & R_1^{-1} \\ R_1^{-1} & R_1^{-1} \end{bmatrix}$

c. $\begin{bmatrix} R_1^{-1} & 0 \\ 0 & 0 \end{bmatrix}$

d. $\begin{bmatrix} R_1^{-1} & 0 \\ R_1^{-1} & 0 \end{bmatrix}$

52. Two identical T-sections, such as one shown below are connected in series.



What is the y_{11} of the combination?

a. 11/240 ℧

b. 22/240 ℧

c. 11/360 ℧

d. 22/120 ℧

Transmission Parameters

9. In the case of ABCD parameters, if all the impedances in the network are doubled, then

(a) A and D remain unchanged, C is halved and B is doubled

(b) A, B, C and D are doubled

(c) A and B are doubled, C and D are unchanged

(d) A and D are unchanged, C is doubled and B is halved

12. A, B, C and D represent the transmission parameters of a two-port network. When is the network reciprocal?

a. AB - CD = 1

b. AD - BC = 1

c. AB - CD = 0

d. AD – BC = 0

44. For an ideal step-down (n: 1) transformer, which one of the following is the ABCD parameter matrix?

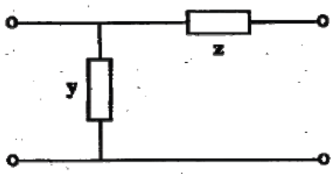
a. $\begin{bmatrix} n & 1 \\ 1 & n \end{bmatrix}$

b. $\begin{bmatrix} n & 0 \\ 0 & n \end{bmatrix}$

c. $\begin{bmatrix} n & 0 \\ 0 & 1/n \end{bmatrix}$

d. $\begin{bmatrix} n & 1/n \\ 1/n & 1 \end{bmatrix}$

71.



Which one of the following is the transmission matrix for the network shown in the figure given above?

a. $\begin{bmatrix} 1 & 1+yz \\ y & z \end{bmatrix}$

b. $\begin{bmatrix} 1+yz & z \\ y & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 2 \\ 0.1 & 4 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 1+yz \\ z & y \end{bmatrix}$

72. Two 2-port networks with transmission matrices,

$$T_A = \begin{bmatrix} 1 & 2 \\ 0.1 & 4 \end{bmatrix} \text{ and } T_B = \begin{bmatrix} 2 & 4 \\ 0.5 & 3 \end{bmatrix}$$

are connected in cascade. Which is the transmission matrix of the combination?

a. $\begin{bmatrix} 3 & 10 \\ 2.2 & 12.4 \end{bmatrix}$

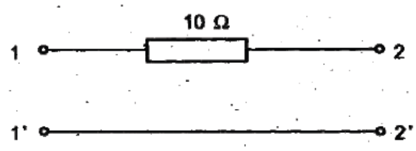
b. $\begin{bmatrix} 3 & 6 \\ 0.2 & 12.4 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 10 \\ 2.0 & 12.0 \end{bmatrix}$

d. $\begin{bmatrix} 3 & 10 \\ 12.4 & 2.2 \end{bmatrix}$

43. The input voltage V1 and current I1 for a linear passive network is given by $V_1 = AV_2 + BI_2$ and $I_1 = CV_2 + DI_2$

Now consider the following network:



Which one of the following is the transfer matrix?

$\begin{bmatrix} A & B \\ C & D \end{bmatrix}$

of the network shown above?

a. $\begin{bmatrix} 1 & 0 \\ 0 & 10 \end{bmatrix}$

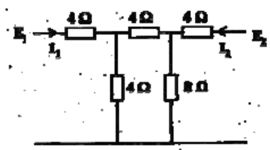
b. $\begin{bmatrix} 1 & 10 \\ 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 0 & 1 \\ 10 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 0 & 10 \\ 1 & 0 \end{bmatrix}$

Hybrid Parameters

70.



What is the value of the parameter h12 for the 2-port network shown in the figure give above?

a. 0.125Ω

b. 0.167 Ω

c. 0.250 Ω

d. 0.625 mho

84. Consider the following statements for a 2-port network:

1. $Z_{11} = Z_{22}$
2. $h_{12} = h_{21}$
3. $Y_{12} = -Y_{21}$
4. $BC - AD = -1$

The network is reciprocal if and only if

a. 1 and 2 are correct

b. 2 and 3 are correct

c. 3 and 4 are correct

d. 4 alone is correct

113. The h parameters h_{11} and h_{22} are related to z and y parameters as

a. $h_{11} = z_{11}$ and $h_{22} = 1/z_{22}$
b. $h_{11} = z_{11}$ and $h_{22} = y_{22}$
c. $h_{11} = 1/y_{11}$ and $h_{22} = 1/z_{22}$
d. $h_{11} = 1/y_{11}$ and $h_{22} = y_{22}$

47. Match List-I (Parameters) with List-Il (Units) and select the correct answer using the codes given below the lists:

List-I

A. h_{11}
B. h_{12}
C. h_{22}

List-II

1. Dimensionless
2. Ohms
3. Siemens

	A	B	C
a.	1	2	3
b.	1	3	2
c.	2	1	3
d.	3	2	1

13. Match List I with List II and select the correct answer using the code given below the lists;

List-I

(Network parameter)

A. h_{11}
B. h_{12}
C. h_{22}
D. h_{21}

List-II

(Dimension)

1. Impedance
2. Admittance
3. Current ratio
4. Voltage ratio

Code:

	A	B	C	D
a.	2	4	1	3
b.	2	3	1	4
c.	1	3	2	4
d.	1	4	2	3

60. Two two-port networks are connected in parallel. The combination is to be represented as a single two-port network. The parameters of this network are obtained by addition of the individual :

a. z-parameters
b. h-parameters
c. y-parameters
d. ABCD parameters

68. Match List-I (Term) with List-II (Concept) and select the correct answer using the code given below the Lists :

List-I

A. Norton equivalent of one port
B. Open-circuit output admittance
C. Reciprocal network
D. Transmission parameters

List-II

1. Network where loop and mode equations have a symmetric coefficient matrix
2. Hybrid parameter h_{22}
3. Parameters where V_1 and I_1 are expressed as functions of V_2 and $-I_2$
4. Current source in parallel with Thevenin impedance

	A	B	C	D
a.	1	3	4	2
b.	4	2	1	3
c.	1	2	4	3
d.	4	3	1	2

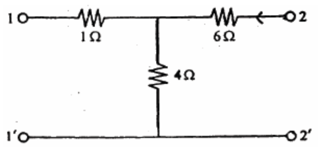
66. Which of the following are the conditions for a two port passive network to be reciprocal one?

1. $z_{12} = z_{21}$
2. $y_{12} = y_{21}$
3. $h_{12} = - h_{21}$

Select the correct condition from the code given below:

a. Only 1 and 2
b. Only 2 and 3
c. Only 1 and 3
d. 1, 2 and 3

74.



For the 2-port network shown in the figure given above, what is the value of the parameter h_{21}?

a. 1.5
b. -0.4
c. 0.6
d. -0.5

57. Match List I with List II and select th correct answer using the code given belo the lists :

	List I (Network parameter)		*List II (Measured under open-circuit conditions)*
A.	Z_{11}	1.	$\left.\frac{V_2}{I_2}\right\vert I_1 = 0$
B.	A	2.	$\left.\frac{V_1}{V_2}\right\vert I_2 = 0$
C.	C	3.	$\left.\frac{V_1}{I_1}\right\vert I_2 = 0$
D.	Z_{22}	4.	$\left.\frac{I_1}{V_2}\right\vert I_2 = 0$

Code :

	A	B	C	D
(a)	1	4	2	3
(b)	3	4	2	1
(c)	1	2	4	3
(d)	3	2	4	1

16. Match List I with List II and select th correct answer using the code given below the lists :

	List I (Excitation)		*List II (Two-port parameters)*
A.	I_1, I_2	1.	z
B.	V_1, V_2	2.	y
C.	V_1, I_2	3.	g
D.	I_1, V_2	4.	h

Code :

	A	B	C	D
(a)	1	2	3	4
(b)	4	2	3	1
(c)	1	3	2	4
(d)	4	3	2	1

95. A two-port network has the ABCD parameters $\begin{bmatrix} 7 & 8 \\ 3 & 4 \end{bmatrix}$. Two such identical networks are cascaded. The ABCD parameters of the overall cascaded network will be

(a) $\begin{bmatrix} 14 & 16 \\ 6 & 8 \end{bmatrix}$

(b) $\begin{bmatrix} 73 & 88 \\ 33 & 40 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 49 & 64 \\ 9 & 16 \end{bmatrix}$

21. A two-port network is described by the following equations :

$$V_1 = 50\, I_1 + 20\, I_2$$

$$V_2 = 30\, I_1 + 10\, I_2$$

Then, which one of the following is ***not*** correct ?

(a) $Z_{12} = 20$

(b) $Y_{12} = 0{\cdot}2$

(c) $h_{12} = 2{\cdot}0$

(d) $A = 25$

24. Consider the following statements :

The transfer impedances of a 2-port network remain constant when the position of excitation and response are interchanged if the network

1. is linear.
2. contains bilateral elements.
3. has high impedance.
4. is resonant.

Which of the above statements is/are correct ?

(a) 1 and 2 only

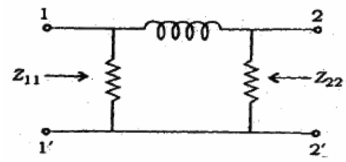
(b) 1, 3 and 4 only

(c) 2 only

(d) 1, 2, 3 and 4

Network Functions

102.



If the driving-point impedance Z_{11} of the network shown in the figure above is given by $Z_{11} = k_1\left(\frac{s+3}{s+8}\right)$ then what is the driving-point impedance Z_{22} ?

a. $k_2\left(\frac{s+5}{s+3}\right)$

b. $k_2\left(\frac{s+5}{s+8}\right)$

c. $k_2\left(\frac{s+3}{s+5}\right)$

d. $k_2\left(\frac{s+8}{s+5}\right)$

(k_1 and k_2 are scale factors)

114. The driving point impedance $Z(s) = \frac{s+2}{s+3}$. The system is initially at rest. For a voltage signal of unit step, the current i(t) through the impedance Z is given by

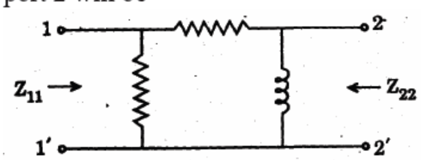
a. $2 - e^{-t}$

b. $3/2 - 1/2e^{-3t}$

c. $3/2 - 1/2e^{-2t}$

d. $3 - 2e^{-3t}$

52. In the given 2-port network, if the driving-point (d. p.) impedance at port 1 is $Z_{11}(s) = K_1\frac{(s+2)}{(s+5)}$ the d. p. impedance at port 2 will be



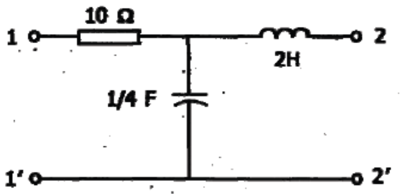
a. $Z_{22}(s) = K_2\frac{(s+3)}{(s+5)}$

b. $Z_{22}(s) = K_2\frac{(s+2)}{(s+3)}$

c. $Z_{22}(s) = K_2\frac{s}{(s+5)}$

d. $Z_{22}(s) = K_2\frac{s}{(s+2)}$

65.



What is the open circuit impedance $Z'_{11}(s)$ of the network shown in the figure given above?

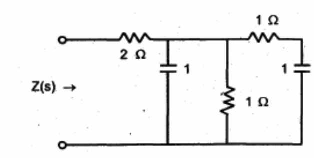
a. $10 + 2s$

b. $\left(10-\frac{4}{s}\right)$

c. $\left(10+\frac{4}{s}\right)$

d. $10-2s$

53. The realization of the driving points impedance function $Z(s)=\left(\alpha s^2+7s+3\right)/\left(s^2+3s+\beta\right)$ is shown in the circuit given below:



What are, respectively the values of α and β?

a. 5,2

b. 2,5

c. 2,3

d. 2,1

116. Assertion (A) : A two-terminal network representing a given driving point reactance function is said to be a canonic or a fundamental network.

Reason (R) : A driving point reactance function is totally specified by the location of poles and zeros.

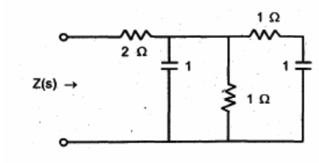
a. Both A and R are individually true and R is the correct explanation of A

b. Both A and R are individually 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

53. The realization of the driving points impedance function $Z(s)=\left(\alpha s^2+7s+3\right)/\left(s^2+3s+\beta\right)$ is shown in the circuit given below:



What are, respectively the values of α and β?

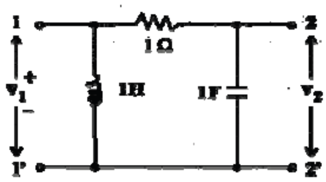
a. 5,2

b. 2,5

c. 2,3

d. 2,1

61.



For the network shown above, Match List I (y-parameter) with List II (Value) and select the correct answer using the code given below the Lists:

List I

A. y_{11}

B. y_{12}

C. $y_{22} + y_{21}$

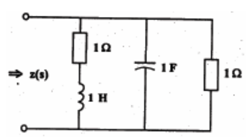
D. y_{22}

List II

1. s + 1
2. –1
3. 1 + 1/s
4. s

	A	B	C	D
a.	3	2	4	1
b.	1	4	2	3
c.	3	4	2	1
d.	1	2	4	3

73.



For the network shown in the figure given above, what is the value of z/s?

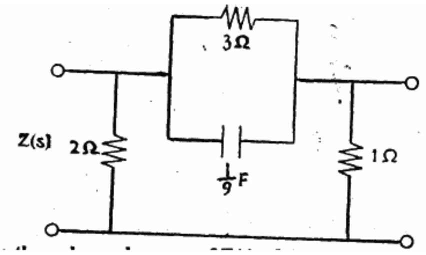
a. $\dfrac{s^2+2s+2}{s+1}$

b. $\dfrac{s+2}{(s+1)^2}$

c. $\dfrac{s+1}{s^2+2s+2}$

d. $\dfrac{(s+1)^2}{(s+2)}$

78.



What are the poles and zeroes of Z(s) of the above network?

a. s = - 12, s = - 6
b. s = - 6, s = - 12
c. s = - 3, s = - 6
d. s = - 2, s = - 4

d. 1/(1 +2s)

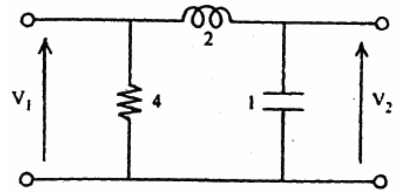
41. The impedance of a parallel RLC network is $Z(s)=\dfrac{5s}{s^2+0.5s+100}$. Then the value of R, L and C are, respectively

a. 10 Ω, 1/20 H, 1/5 F
b. 1 Ω, 1/2 H, 1/5 F
c. 10 Ω, 1/20 H, 1/2 F
d. 2 Ω, 1/20 H, 1/5 F

42. For a driving point impedance function $Z(s)=\dfrac{s+\alpha}{s+\beta}$ the voltage will lead the current sinusoidal input, iff

a. α and β real positive and α > β
b. α is real positive and β is real negative and α > β
c. α and β are real positive and β > α
d. α and β are real negative and β > α

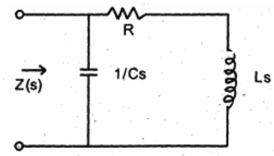
85.



For the two port network shown above, what is the voltage transfer function $V_2(s)$ / $V_1(s)$?

a. $s/(1+2s^2)$
b. s/(1+2s)
c. $1/(1 + 2s^2)$

43.



The impedance Z(s) in the above circuit is

a. $\dfrac{1}{C}\left(\dfrac{s+(R/L)}{s^2+(R/L)s+(1/LC)}\right)$

b. $\dfrac{1}{L}\left(\dfrac{s+(1/RC)}{s^2+(1/RC)s+(1/LC)}\right)$

c. $\dfrac{1}{L}\left(\dfrac{s+(R/L)}{s^2+(1/RC)s+(1/LC)}\right)$

d. $\dfrac{1}{C}\left(\dfrac{s+(1/RC)}{s^2+(R/L)s+(1/LC)}\right)$

44. A unit step current of 1 A is applied to a network whose driving point impedance is $Z(s)=\dfrac{V(s)}{1(s)}=\dfrac{s+3}{(s+2)^2}$.

Then the steady state and initial values of the voltage developed across the source are respectively

a. (3/4 V, 1 V)
b. (1/4 V, 3/4 V)
c. (3/4 V, 0 V)
d. (1 V, 3/4 V)

86. Assertion (A): A driving point impedance function has multiple zeros on fro—axis of the s-plane

Reason (R): A positive real function has no multiple poles or zero on jω-axis of the s-plane.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually 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

91. Match the List I (Network) with List II (Poles of driving- point impedance) and select the correct answer:

List I

A. LC
B. RC
C. RLC
D. RL

List II

1. Negative real
2. Imaginary
3. Either real or complex

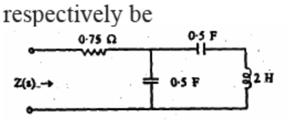
Codes;

	A	B	C	D
a.	1	2	3	1
b.	1	2	1	3
c.	2	1	1	3
d.	2	1	3	1

104. A pole of driving point admittance function implies

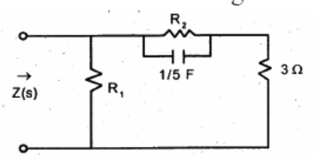
a. Zero current for a finite value of driving voltage
b. Zero voltage for a finite value of driving current
c. An open circuit condition
d. None of (a), (b) and (c) mentioned in the question

105. The driving point function of the circuit shown in the given figure when $s \to 0$ and $s \to \infty$, (the elements are normalized) will respectively be



a. 1/s and 2/s
b. 1/s and 0.75
c. 0.75 and 2/s
d. 2/sand 0.75

47. Consider the following circuit:



In the above circuit $Z(s) = 2$ as $s \to \infty$ and Z (s) = 3 as $s \to 0$. What are, respectively the values of R_1 and R_2?

a. 6Ω, 3Ω
b. 4Ω, 2Ω
c. 3Ω, 6Ω
d. 6Ω, 2Ω

Characteristic Impedance

67. What is the characteristic impedance Z_0 of a line having resistance R, inductance L, capacitance C and conductance G?

a. $\sqrt{\dfrac{R+j\omega L}{G+j\omega C}}$

b. $\sqrt{\dfrac{G+j\omega C}{R+j\omega L}}$

c. $R+j\omega L-\dfrac{G}{\omega C}$

d. $\sqrt{R^2+\left(\omega L-\dfrac{1}{\omega C}\right)^2}$

43. The driving-point impedance function of a reactive network is:

$$Z(s)=\frac{(s^2+4)(s^2+16)}{s(s^2+9)}$$

Consider the following circuits in this regard:

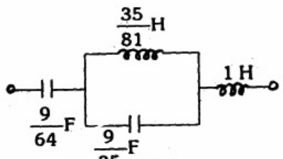


Fig.I

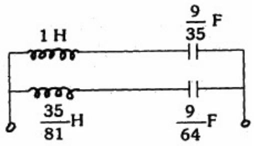


Fig.II

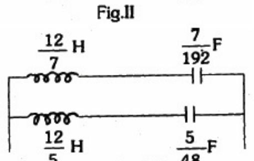


Fig.III

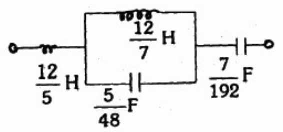


Fig.IV

The first second Foster forms will be as in figure

a. I and III respectively
b. II and IV respectively
c. I and II respectively
d. III and IV respectively

14. Which one of the following is correct? The impedance function

$$z(s)=\frac{(s^2+1)(s^2+3)}{s(s^2+2)}$$ is an

a. LC driving point function
b. RL driving point function
c. RC driving point function
d. PLC driving point function

45. The polynomial

$P(s)=(s-1)(s^2+1)(s+2)(s+3)$ is

a. Hurwitz, but not strict Hurwitz
b. Not Hurwitz
c. Strict Hurwitz
d. Anti-Hurwitz

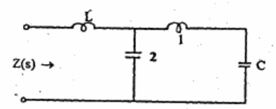
46. The poles and zeros of a driving-point function of a network are simple and interlace on the negative real axis with a pole closest to the origin. It can be realized

a. By an LC network
b. As an RC driving-point impedance
c. As an RC driving-point admittance
d. Only by an RLC network

111. Cauer and Foster forms of realizations are used only for

a. Driving point reactance functions
b. Transfer reactance functions v
c. Driving point impedance functions
d. Transfer impedance functions

112. For the given driving point impedance function $Z(s)=\frac{4s^4+7s^2+1}{s(2s^2+3)}$, the circuit realization is shown in the given figure. Then the values of L and C are respectively



a. 0.5 and 5
b. 2 and 1
c. 4 and 1
d. 4 and 3

67. The network function, $F(s)=\frac{(s+2)}{(s+1)(s+3)}$ represents an:

a. RL impedance only
b. RC impedance only
c. RL admittance and RC impedance
d. RC admittance and RL impedance

46. The driving point impedance function $Z(s)=\frac{s^2+2s+2}{s^2+s+1}$ can be realized as a

a. R-C network
b. R-L network
c. L-C network
d. R-L-C network

54. Impedance $Z(s)=[(s+3)(s+5)]/[(s+4)(s+6)]$ is realized in the Foster's second form. What will be the values, respectively of R and L in one of the series R-L branches?

a. 2Ω, 1/3 H
b. 2Ω, 4/3 H
c. 2Ω, 5/3H
d. 2Ω, 2/3H

63. Match List I with List II with respect to the synthesis of R-C driving point function Z(s) = 1/Y(s) and select the correct answer using the code give below the lists:

List I
(Form)
A. Foster I form
B. Foster Ii form
C. Cauer I form
D. Cauer II form

List II
(Method)
1. Continued fraction expansion of Z(s) around $s=\infty$
2. Partial fraction expansion of Y(s)/s
3. Continued fraction expansion of Z(s around $s=0$
4. Partial fraction expansion of Z(d)

Code:

	A	B	C	D
a.	1	2	4	3
b.	4	3	1	2
c.	1	3	4	2
d.	4	2	1	3

64. The lowest and the highest critical frequencies of an R-L driving point impedance are, respectively

a. a zero, a pole
b. a pole, a pole
c. a zero, a zero
d. a pole, a zero

65. For an RC driving point impedance function $Z_{RC}(s)$

a. $Z_{RC}(0) \geq Z_{RC}(\infty)$
b. $Z_{RC}(0) = Z_{RC}(\infty)$ only
c. $Z_{RC}(0) \leq Z_{RC}(\infty)$
d. $Z_{RC}(0) > Z_{RC}(\infty)$ only

41. The driving-point impedance of a one-port reactive network is given by

a. $\frac{(s^2+1)(s^2+2)}{s(s^2+3)(s^2+4)}$
b. $\frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$
c. $\frac{s(s^2+1)}{(s^2+2)(s^2+3)}$
d. $\frac{1}{s+1}$

97. Consider the following network functions :

1. $\frac{(s^2+1)(s^2+4)}{(s^2+3)(s^2+9)}$
2. $\frac{(s^2+1)(s^2+9)}{s(s^2+4)}$
3. $\frac{s(s^2+9)}{(s^2+1)(s^2+4)}$
4. $\frac{s(s^2+4)}{(s^2+1)}$

Which of the above functions can represent L-C driving-point immittances ?

a. Only 1 and 2
b. Only 2 and
c. Only 2 and 4
d. Only 1 and 3

100. Consider the following statements in connection with the properties of R-C impedance functions:

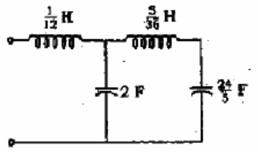
1. All the poles and zeros are simple.
2. Poles and zeros interlace.
3. Poles and zeros are located on the negative real axis of the s-plane.

Which of the statements given above are correct?

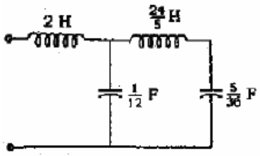
a. 1, 2 and 3
b. Only l and 2
c. Only 2 and 3

d. Only 1 and 3

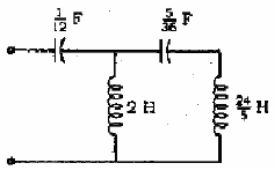
101. $Z(s) = \dfrac{2(s^2+1)(s^2+9)}{s(s^2+4)}$ may be synthesized into Cauer first form as



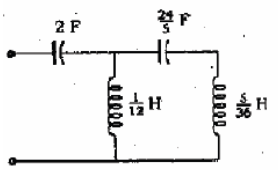
a.



b.



c.



d.

74. If Y_1 and Y_2 are the RC driving point admittance and impedance function, respectively, such that $\dfrac{Y_1}{Y_2} = \dfrac{(s+1)(s+3)}{(s+2)^2}$ then, the value of Y_2 can be

1. $\dfrac{s+3}{s+2}$
2. $\dfrac{s+2}{s+1}$
3. $\dfrac{s+2}{(s+1)(s+3)}$
4. s +2

Which of the above are correct?

a. 1 and 2
b. 2 and 3
c. 3 and 4
d. 1 and 4

73. From the given list of driving point impedance functions, which one can be realized using R and C elements only

$$Z_1(s) = \frac{(s+8)}{(s+2)(s+6)}$$

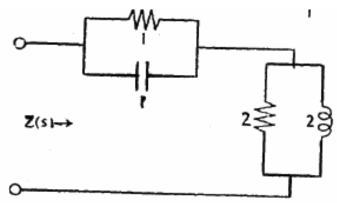
$$Z_2(s) = \frac{(s+2)(s+6)}{(s+4)}$$

$$Z_3(s) = \frac{(s+4)}{(s+2)}$$

$$Z_4(s) = \frac{(s+2)}{(s+1)(s+3)}$$

a. $Z_1(s)$
b. $Z_2(s)$
c. $Z_3(s)$
d. $Z_4(s)$

89.



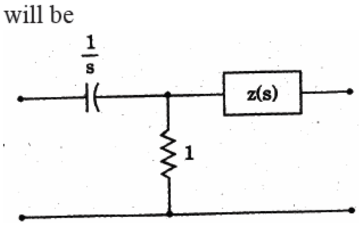
For the circuit shown above, the poles of the driving-point impedance function are at which one of the following locations?

a. A pole at s = -2
b. A pole at s = -1
c. A double pole at s = -1
d. Poles at s = -1 and s -2

109. Which one of the following statements is correct? The poles and zeros of the driving point reactance function of an L-C network

a. lie on the real axis of the s-plane
b. alternate
c. lie on the unit; circle
d. are arbitrary

28. If the two-port network shown in the given figure has the constant B $\dfrac{2s+1}{s^2}$ then z(s) will be



a. s
b. 1/s
c. s + 1
d. 1 + 1/s

98. Consider the following statements regarding the driving- point admittance function.

$$Y(s)=\frac{s^2+2.5s+1}{s^2+4s+1}$$

1. It is an admittance of RL network.
2. Poles and zeros alternate on the negative real axis of the s-plane.
3. The lowest cricitcal frequency is a pole.
4. $Y(0)=1/3$.

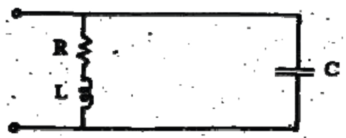
Which of these statements are correct?

a. 1, 2 and 3
b. 2 and 4
c. 1 and 3
d. 1, 2, 3 and 4

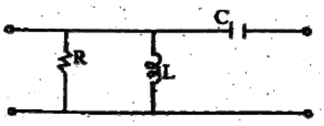
99. An R-L-C circuit for the driving-point admittance function $\left(\dfrac{\frac{1}{RLs}}{\frac{1}{R}+\frac{1}{Ls}}+Cs\right)$ is

a.

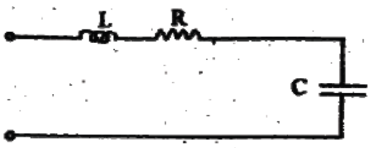
b.



c.



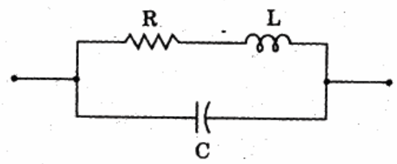
d.



101. Poles and zeros of a driving-point function of a network are simple and interlace on the jω axis. The network consists of elements

a. R and C
b. L and C
c. R and L
d. R, L and C

27. If the driving-point impedance function $\frac{2s+1}{8s^2+4s+1}$ is synthesized as shown in the given figure, then the values of R, L and C will be respectively



a. 1, 2 and 4
b. 2, 1 and 4
c. 1, 4 and 2
d. 4, 2 and 1

100. Match List I with list II for the driving-point impedance synthesis and select the correct answer:

List (form)

A. Cauer I
B. Cauer II
C. Foster I
D. Foster II

List II (Networks)

1. L in series aims and C in shunt arms of a ladder
2. C in series arms and L in shunt arms of a ladder
3. Series combination of L and C in parallel
4. Parallel combination of L and C in series

Codes;

	A	B	C	D
a.	1	2	3	4
b.	1	2	4	3
c.	2	1	4	3
d.	2	1	3	4

43. If the initial voltage across the capacitor of 2 Farad is V(0) = 1, the voltage and charge on the capacitor at t = 3 sec after connecting a current source I_S = 2 A at t = 0 are respectively

(a) 2 V, 4 coulomb

(b) – 2 V, 4 coulomb

(c) 4 V, 8 coulomb

(d) 8 V, 4 coulomb

47. Consider the following statements :

A step voltage is applied to an under-damped series RLC circuit in which R is variable. If R is

1. increased, the steady-state voltage across C will be reduced.
2. increased, the frequency of transient oscillations across C will be reduced.
3. reduced, the transient oscillations will die down at a fast rate.
4. reduced to zero, the peak amplitude of the voltage across C will be double that of input voltage.

Which of the above statements is/are correct ?

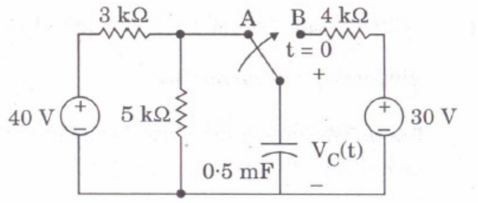
(a) 2 only

(b) 4 only

(c) 2 and 4 only

(d) 1, 2, 3 and 4

49.



For the circuit shown above, the switch has been in position A for a long time. At t = 0, the switch is moved to B. Then, the capacitor voltage $V_C(t)$ for t > 0 is

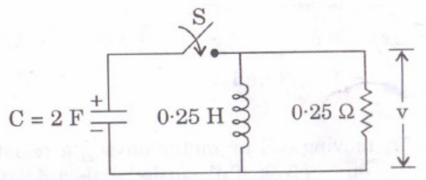
(a) $V_C(t) = (24 - 6\,e^{-2t})$ V

(b) $V_C(t) = (30 - 15\,e^{-0.5t})$ V

(c) $V_C(t) = (6 - 6\,e^{-2t})$ V

(d) $V_C(t) = (30 - 5\,e^{-0.5t})$ V

55.



For the given circuit, the initial inductor current and the voltage across the capacitor are zero and 2, respectively. When the switch S is closed at t = 0, the values of v and $\frac{dv}{dt}$ are, respectively

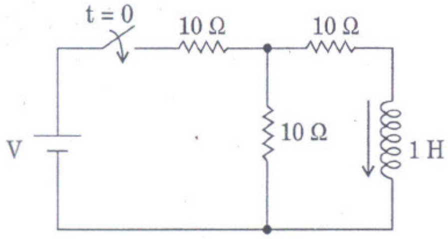
(a) 2, – 4

(b) 0, 0·25

(c) 0, – 0·5

(d) 2, 0

100.



The value of V that would result in a steady-state current of 1 A through the inductor in the above circuit is

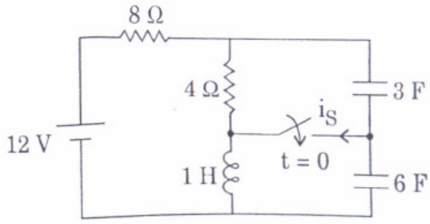
(a) 30 V

(b) 15 V

(c) 20 V

(d) 25 V

61.



In the circuit shown above, the switch is closed after a long time. The current $i_S(0^+)$ through the switch is

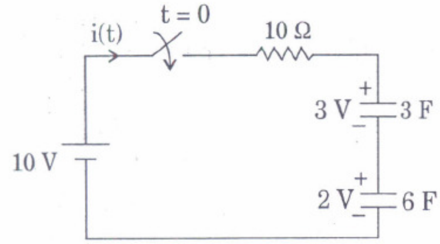
(a) 1 A

(b) 2/3 A

(c) 1/3 A

(d) 0 A

38.



In the circuit shown above, switch S is closed at t = 0. The time constant of the circuit and initial value of current i(t) are

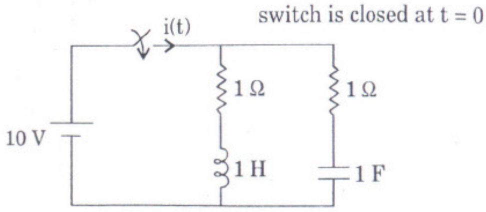
(a) 30 sec, 0·5 A

(b) 60 sec, 1·0 A

(c) 90 sec, 1·0 A

(d) 20 sec, 0·5 A

41.



The value of the current i(t) in amperes in the above circuit is

(a) 0

(b) 10

(c) $10\, e^{-t}$

(d) $10\,(1 - e^{-t})$

44. A first order circuit is excited with a dc source. The current i(t) through any element of the circuit can be written as (i_f and i_i are the final and initial values, respectively, of the current)

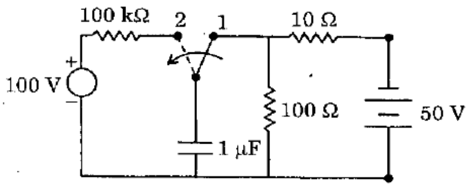
(a) $i_i - (i_i - i_f)\, e^{-\frac{t}{T}}$

(b) $i_f - (i_f - i_i)\, e^{-\frac{t}{T}}$

(c) $i_i - (i_f - i_i)\, e^{-\frac{t}{T}}$

(d) $i_f - (i_i - i_f)\, e^{-\frac{t}{T}}$

46.



In the above circuit, the switch has been in position 1 for quite a long time. At t = 0 the switch is moved to position 2. At this position what is the time constant ?

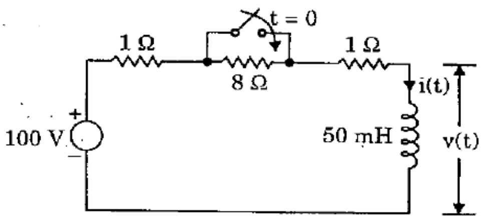
(a) 0·1 s

(b) 1 s

(c) 0·11 s

(d) 1·11 s

17.



In the above circuit, the switch is open for a long time. At time t = 0, the switch is closed. What are the initial and final values of voltages across the inductor ?

(a) 0 V and 0 V

(b) 0 V and 80 V

(c) 80 V and 0 V

(d) 80 V and 80 V

86. The response of an initially relaxed, linear constant-parameter network to a unit impulse applied at t = 0 is $4e^{-2t}\,u(t)$. What is the response of this network to unit step function ?

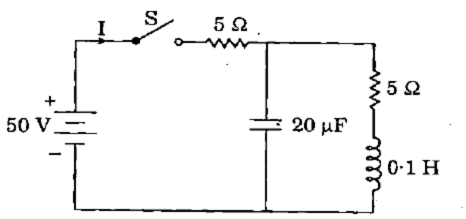
(a) $2\,(1 - e^{-2t})\,u(t)$

(b) $4\,(e^{-t} - e^{-2t})\,u(t)$

(c) sin 2t

(d) $(1 - 4e^{-4t})\,u(t)$

90.



The network shown above is initially at rest. What is the initial current I when the switch S is closed at t = 0 ?

(a) 0 A

(b) 5 A

(c) 10 A

(d) 20 A

45. For a series R-L-C circuit, the characteristic equation is given as

$$s^2 + \frac{R}{L}s + \frac{1}{LC} = 0$$

If $\frac{R}{2L}$ is denoted by α and $\frac{1}{\sqrt{LC}}$ by β, then under the condition of $\beta^2 > \alpha^2$, the system will be

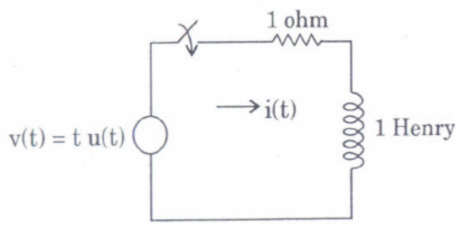
(a) critically damped

(b) under damped

(c) undamped

(d) over damped

1.



The current in the above network is

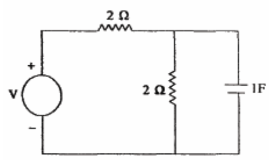
(a) $|t - 1 + e^{-t}|\,u(t)$

(b) $|t^2 - t + e^{-t}|\,u(t)$

(c) $|t + 1 + e^{-t}|\,u(t)$

(d) $|t - 1 - e^{-t}|\,u(t)$

75.



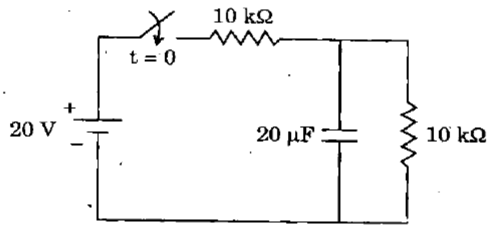
What is the time constant of the circuit above?

a. 0.5 s

b. 1s

c. 2s

d. 4s

97. 

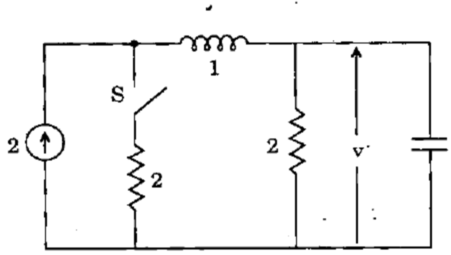
The switch of above circuit was open for long, and at t = 0 it is closed. What is the final steady state voltage across the capacitor and the time-constant of the circuit ?

(a) 0 V and 0·1 sec

(b) 20 V and 0·2 sec

(c) 10 V and 0·2 sec

(d) 10 V and 0·1 sec

93. 

The circuit as shown above is in the steady state. The switch S is closed at t = 0. What are the values of v and $\frac{dv}{dt}$ at $t = 0^+$?

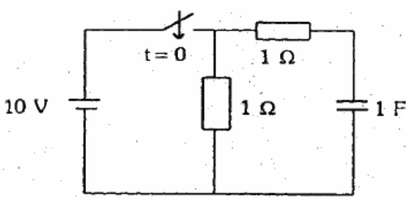
(a) 0 and 4

(b) 4 and 0

(c) 2 and 0

(d) 0 and 2

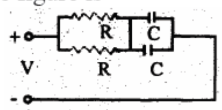
42. In the circuit shown in the given figure, the switch is closed at t = 0.



The current through the capacitor will decrease exponentially with a time constant

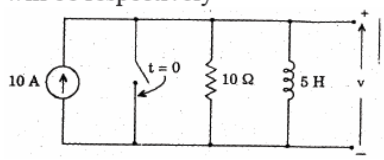
a. 0.5 s
b. 1 s
c. 2 s
d. 10 s

45. The time-constant to the network shown in the figure is

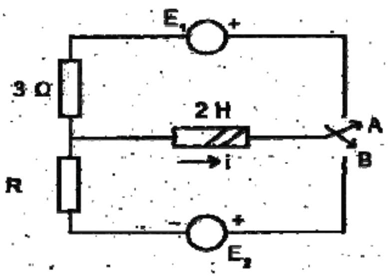


a. CR
b. 2CR
c. CR/4
d. CR/2

31. In the circuit shown in the given figure, if the switch is closed at t = 0, then the voltage $v(0^+)$ arid its derivative $dv/dt|_{t=0^+}$ will be respectively



a. 10 V and 50 V/s
b. 10 V and -50 V/s
c. 100 V and 200 V/s
d. 100 V and -200 V/s

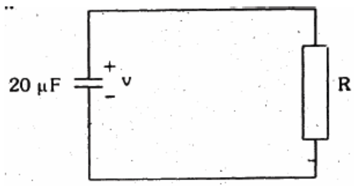
59. 

In the circuit shown above, the switch is moved from position A to B at time t = 0. The current i through the inductor satisfies the following conditions

1. $i(0) = -8A$
2. $di/dt\ (t = 0) = 3A/s$
3. $I(\infty) = 4A$

The value of R is

a. 0.5 ohm
b. 2.0 ohm
c. 4.0 ohm
d. 12 ohm

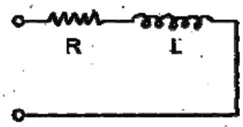


For the circuit shown in the given figure, if $C = 20\ \mu F$, $v(0^-) = -50$ V and $dv(0^-)/dt = 500$ V/S, then R is

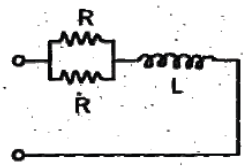
a. 5 K
b. 3 K
c. 5 K
d. 10 K

61.

1.



2.



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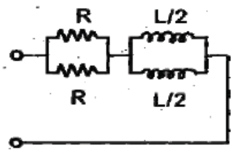
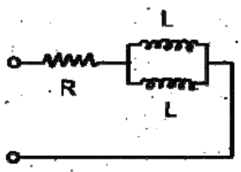


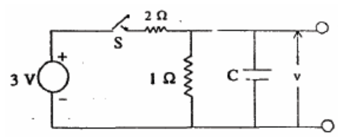
4.



The correct sequence of the time constants of the circuits shown above in the increasing order is

a. 1 – 2 – 3 – 4
b. 4 – 1 – 2 – 3
c. 4 – 3 – 1 – 2
d. 4 – 3 – 2 – 1

76.



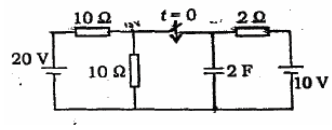
In the network shown above, it is given that v = 1 V and $\frac{dv}{dt} = -10$ V/s at a time t, where t is the time after the switch S is closed. What is the value of C?

a. 0.05 F
b. 0.1 F
c. 0.15 F
d. 0.2 F

78. A series R-L-C circuit is switched on to a step voltage V at t = 0. What are the initial and final values of the current in the circuit, respectively?

a. V/R, V/R
b. Zero, Infinity
c. Zero, Zero
d. Zero, V/R

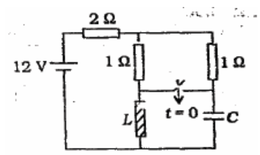
1.



In the circuit show above, the switch is open for a long time and closed at time t = 0. What is the current through the switch after the switch is closed?

a. Zero
b. 1 A
c. 2 A
d. 5 A

2.



In the circuit shown above, the switch is closed at t = 0. What is the initial value of the current through the capacitor?

a. 0.8 A
b. 1.6 A
c. 2.4 A
d. 3.2 A

22. Match List I with list II and select the correct answer:

List I

A. A series RLC circuit is overdamped when

B. The unit of the real part of the complex frequency is

C. If F(s) is the Laplace transform of f(t) then F(s) and f(t) are known as

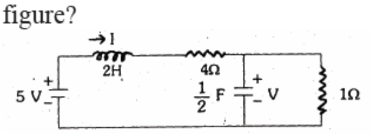
D. If 1(t) and its first derivative are Laplace transferable then the initial value of f(t) is given by

List II

1. f(t) = s F(s)
   lim $t \to 0$ lim $s \to \infty$
2. $R^2/4L^2 < 1/LC$
3. rad/s
4. inverse functions
5. $R^2/4L^2 > 1/LC$
6. neper sec^{-1}
7. f(t) = s F(s)
   lim $t \to 0$ lim $s \to 0$
8. transform pairs

	A	B	C	D
a.	5	6	8	1
b.	5	6	1	8
c.	6	5	3	4
d.	6	5	2	7

40. Which of the following statement (s) is/are true of the circuit shown in the given figure?

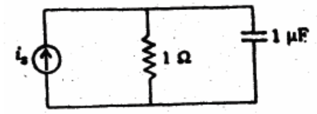


1. It is a first order circuit with steady-state values of $V = \frac{5}{3}V, I = \frac{5}{3}A$
2. It is a second order circuit with steady state values of V = 1 V; I =1 A
3. The network function V(s) /I(s) has one pole.
4. The network function V (s) /I(s) has two poles.

Select the correct answer using the codes given below:

a. 1 and 3
b. 2 and 4
c. 2 alone
d. 1 alone

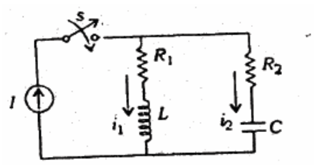
72.



In the circuit shown in the figure above, if i_s = u(t) A, then what are the initial and steady-state voltages across the capacitor?

a. 1 V and I V, respectively
b. 1 V and 0, respectively
c. 0 and I V. respectively
d. 0 and 0, respectively

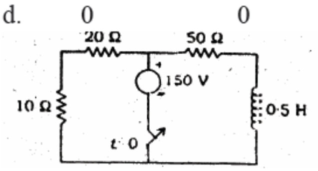
73.



In the circuit shown above, the constant current source of value I is switched on at t = 0. What are the values of currents i_1 and i_2 at t = 0, with zero initial conditions ?

	i_1	i_2
a.	I	0
b.	0	I
c.	$\frac{R_2}{R_1+R_2}I$	$\frac{R_2}{R_1+R_2}I$
d.	0	0

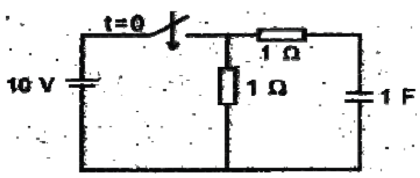
74.



In the circuit shown in the figure given above, the switch is opened at t = 0 after having been closed for a long time. What is the current through 50 Ω resistor?

a. $3e^{-1/160\,t}$
b. $3e^{-1/100\,t}$
c. $3e^{-100\,t}$
d. $3e^{-160\,t}$

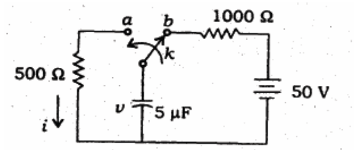
58.



In the circuit shown above, the switch is closed at. t = 0. The current through the capacitor will decrease exponentially with a time constant

a. 0.5 s
b. 1 s
c. 2 s
d. 10 s

90.



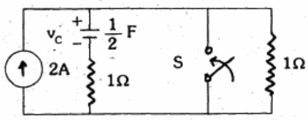
At t = 0, the switch k is thrown from b to a of the circuit as shown above. What are the values of $v(0^+)$ and $i(0^+)$?

a. 50 V,90 mA
b. 50 V, 100 mA
c. 50 V, 110 mA
d. 50 V, 120 mA

91. An R-C series circuit, initially at rest has a step voltage signal. The response v(t) across C is $v(t) = 1 — e^{-3t}$. If now there is an initial voltage at C of 3 volts, what is v(t) for the same step signal?

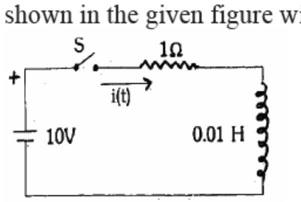
a. $1 + 3e^{-3t}$
b. $1 + 2e^{-3t}$
c. $3e^{-3t}$
d. None of the above

42. The circuit shown in the given figure is in steady-state with, switch 'S' open. The switch is closed at t = 0. The values of $V_c(0^+)$ and $V_c(\infty)$ will be respectively



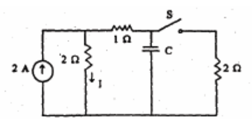
a. 2 V, 0 V
b. 0V,2V
c. 2V,2V
d. 0V,0V

43. After closing the switch 'S' at t = 0, the current i(t) at any instant 't' in the network shown in the given figure will be



a. $10+10e^{100t}$
b. $10-10e^{100t}$
c. $10+10e^{-100t}$
d. $10-10e^{-100t}$

116. The steady state in the circuit, shown in the given figure is reached with S open. S is closed at t = 0. The current I at t = 0^+ is



a. 1A
b. 2A
c. 3A
d. 4A.

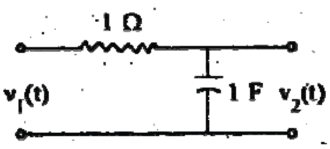
34. A series RL circuit initially relaxed. A step voltage is applied to the circuit. If τ is the time constant of the circuit, the voltage across R and L will be the same at time t equal to

a. $\tau \log_e 2$
b. $\tau \log_e \frac{1}{2}$
c. $\frac{1}{\tau} \log_e 2$
d. $\frac{1}{\tau} \log_e \frac{1}{2}$

19. A series RL circuit is initially relaxed. A step voltage is applied to the circuit. If τ is the time constant of the circuit, the voltage across R and L will be the same at time t equal to

a. $\tau \ln 2$
b. $\tau \ln\left(\frac{1}{2}\right)$
c. $1/\tau \ln 2$
d. $1/\tau \ln\left(\frac{1}{2}\right)$

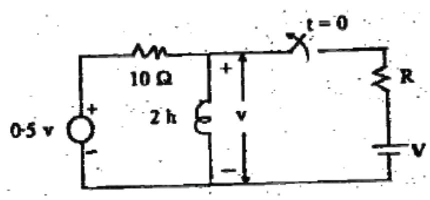
20. For the following circuit a source of $V_1(t) = e^{-2t}$ is applied.



Then the resulting response $v_2(t)$ is given by

a. $e^{-2t} + e^{-t}$
b. e^{-t}
c. $e^{-t} – e^{-2t}$
d. $e^{-2t}/2$

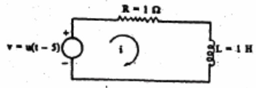
21.



The time constant of the circuit after the switch shown in the figure is opened is

a. 0.2 s
b. 5 s
c. 0.1 s
d. dependent on R and hence cannot be determined unless R is known

107. A unit step u(t–5) is applied to the RL network



The current i is given by

a. $1-e^{-t}$

b. $\left[1-e^{-(t-5)}\right]u(t-5)$

c. $\left(1-e^{-t}\right)u(t-5)$

d. $1-e^{-(t-5)}$

108. The response of an initially relaxed system to a unit ramp excitation is $\left(t+e^{-t}\right)$. Its step response will be

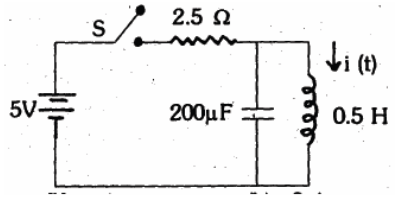
a. $1/2t^2-e^{-t}$

b. $1-e^{-t}$

c. $-e^{-t}$

d. t

33. In the network shown in the figure, the switch 'S' is closed and a steady state is attained. If the switch is opened at t = 0, then the current i (t) through the inductor will be



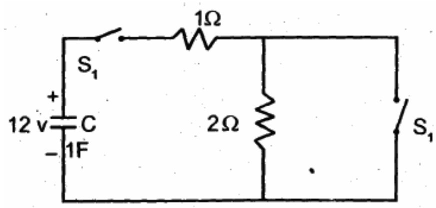
a. Cos 50 t A

b. 2A

c. 2 cos 100 t A

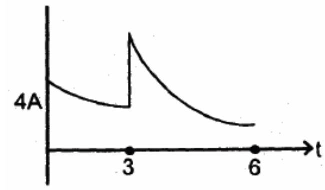
d. 2 sin 50 t A

50.

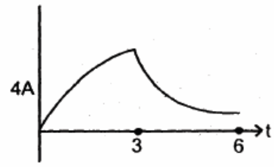


The capacitor in the circuit as shown above is initially charged to 12 V with S_1 and S_2 open S_1 is closed at t = 0 while S_2 is closed at t = 3. The waveform of the capacitor is represented by

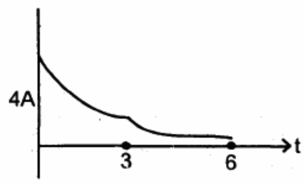
a.



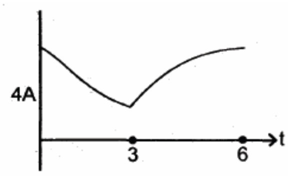
b.



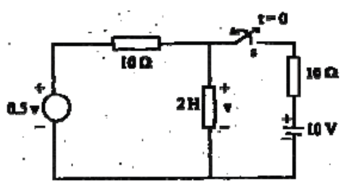
c.



d.



56.



The circuit shown above is under steady-state condition with the switch closed. The switch is opened at t = 0. What is the time constant of the circuit?

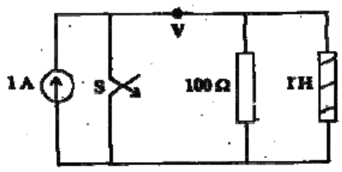
a. 0.1 s

b. 0.2s

c. 5 s

d. 10 s

59.



If the switch S in the circuit shown above is opened at t = 0, what are the values of $v(0^+)$ and $dv/dt\ (0^+)$, respectively?

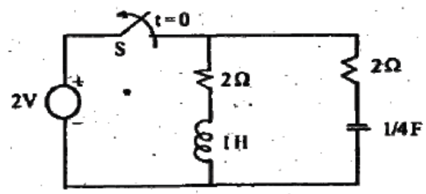
a. 100 V, 10,000 V/s

b. 100 V,-10,000 V/s

c. -100 V, 10,000 V/s

d. -100 V, -10,000 V/s

87. On closing switch 'S' the circuit in the given figure is in steady-state. The current in the inductor after opening the switch 'S' will



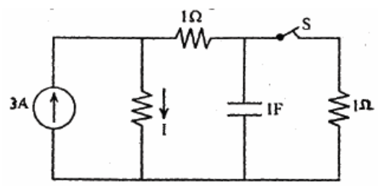
a. decay exponentially with a time constant of ?

b. decay exponentially with a time constant of 0.5s

c. consist of two decaying exponentials each with a time constant of O.5s

d. be oscillatory

65.



In the circuit given above, the steady state is attained with S open. S is closed at t = 0. What is the value of current I at $t = 0^+$?

a. 2 A

b. 2.25 A

c. 3 A

d. 4 A

72. In an RLC series circuit, if the resistance R and the inductance L are kept constant but capacitance C is decreased, then which one of the following statements is/are correct?

1. Time constant of the circuit is changed.
2. Damping ratio decreases.
3. Natural frequency increases.
4. Maximum overshoot is unaffected.

Select the correct answer using the code given below

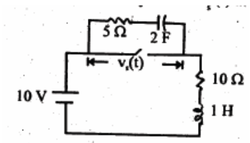
a. 1 and 2

b. 2 only

c. 2 and 3

d. 3 and 4

108. In the network shown, the switch is opened at t = 0. Prior to that, the network was in the steady - state. v_s (t) at $t = 0^+$ is.



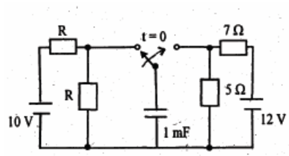
a. 0

b. 5V

c. 10V

d. 15V

109. In the network shown in the figure, the switch had remained closed for a long time on the 10 V source side. If at time t = 0, it is changed to the 12V side, then after one time constant, the voltage across 5Ω in the circuit will be



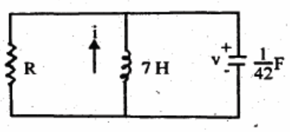
a. 5V

b. $5e^{-1}$V

c. 10 V

d. 12V

110. For the circuit shown in the figure, the value or R for critical damping will be



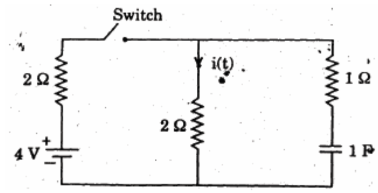
a. 10.5 ohm

b. 6 ohm

c. 3.5 ohm

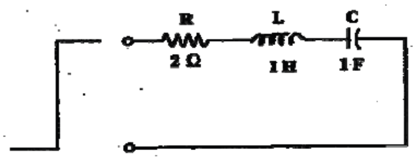
d. 3 ohm

47. In the circuit shown, the switch is opened at t = 0. Prior to that switch was closed, i(t) at t = 0* is



a. 2/3A
b. 3/2A
c. 1/3A
d. 1A

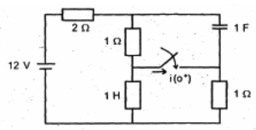
75.



A step voltage is applied to the circuit shown above. What is the transient current response of the circuit?

a. Undamped sinusoidal
b. Overdamped
c. Underdamped
d. Critically damped

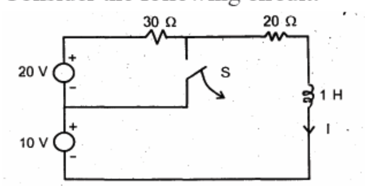
41. Consider the following circuit:



The circuit shown above is in steady state before closing the switch. What is the current $i(o^+)$ through the switch if the circuit is closed at t = 0?

a. – 4A
b. 0 A
c. 4 A
d. 12 A

42. Consider the following circuit:



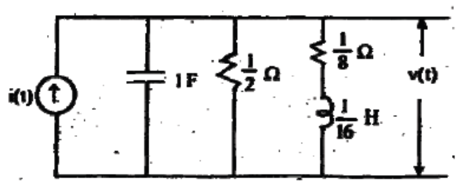
The circuit shown above attains a steady state with the switch S closed. What is the value of 1(t) for t ≥ 0, if the switch S is opened at t = 0?

a. $0.5+0.5\ e^{-50t}$
b. $0.6–0.1e^{-50t}$
c. $0.5–0.5e^{-50t}$
d. $0.6–0.6e^{-20t}$

46. A voltage $v(t) = 6\ e^{-2t}$ is applied at t = 0 to a series R - L circuit with L = 1H. If i(t) = 6[exp (-2t) - exp (-3t) then R will have a value of

a. 2/3 Ω
b. 1 Ω
c. 3 Ω
d. 1/3 Ω

88. In the circuit shown in the figure, i(t) is a unit step current. The steady-state value of v(t) is



a. 2.5V
b. 1 V
c. 0.1 V
d. zero

A.C.Transient Analysis

77. A series R-L circuit is to be connected to an a.c. source $v(t) = V_m \sin(\omega t + \varphi)$ volt. Which one of the following is correct?

The transient current will be absent if the source is connected at a time t_0 such that

a. $\omega t_0 = 0$
b. $\omega t_0 = \frac{\pi}{2}$
c. $\omega t_0 = \tan^{-1}\frac{\omega L}{R}$
d. ωt_0 has any arbiter value

Magnetically Coupled Circuits

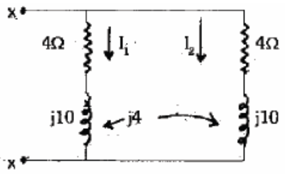
33. The mutual inductance between two coupled coils is 10 mH. If the turns in one coil are doubled and that in the other are halved, then the mutual inductance will be

a. 5 mH
b. 10 mH
c. 14 mH
d. 20 mH

60. Two identical coils of negligible resistance, when connected in series across a 50 Hz fixed voltage source, draw a current of 10A. When the terminals of one of the coils are reversed, the current drawn is 8A. The coefficient of coupling between the two coils is

a. 1/100
b. 1/9
c. 4/10
d. 8/10

63. Consider the following statements:
In the circuit shown in the figure, if the equivalent impedance between x-x is Z_{eq} then



1. $Z_{eq} = 2 + j5$
2. $Z_{eq} = 2 + j3$
3. $I_1 = -I_2$
4. $I_1 = I_2$

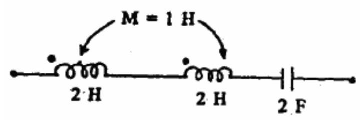
Of these statements

a. 1 alone is true
b. 2 and 4 are correct
c. 2 and 3 are correct
d. 1 and 4 are correct

61. Two coils are coupled in such a way that the mutual inductance between them is 16 mH. If the inductances of the coils are 20 mH and 80 mH respectively, the coefficient of coupling is:

a. 0.01
b. 0.4
c. 0.1
d. 0.0025

119. The resonant frequency of the given series circuit is



a. $1/2\pi\sqrt{3}Hz$
b. $1/4\pi\sqrt{3}Hz$
c. $1/4\pi\sqrt{2}Hz$
d. $1/\pi\sqrt{2}Hz$

52. The inductance matrix of a system of two mutually coupled inductors shown in Fig. 1 is given by $L = \begin{bmatrix} 5 & -4 \\ -4 & 7 \end{bmatrix}$

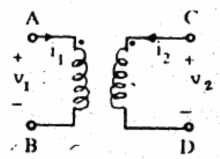


Fig. 1

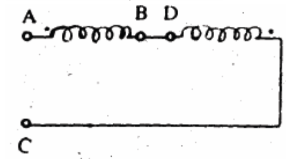
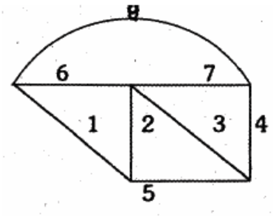


Fig. 2

When the inductors are connected as shown in Fug 2 the equivalent inductance of the system is given by

a. 20 H
b. 4 H
c. 16 H
d. 8 H

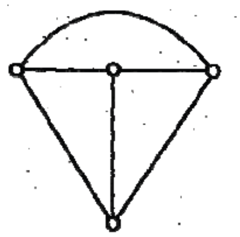
27. In the graph shown in the figure. one possible tree is formed by the branches 4,5,6,7. Then one possible fundamental cut set is



a. 1,2,3,8
b. 1,2,5,6
c. 1,2,6,8
d. 1,2,3,7,8

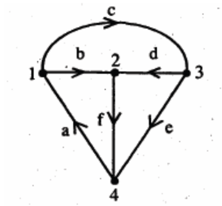
68. Which one of the following statements is not correct?
a. A tree contains all the vertices of its graph
b. A circuit contains all the vertices of its graph
c. The number of f-circuits is the same as the number of chords
d. There are at least two edges in a circuit

63.



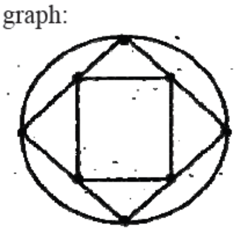
What is the total number of trees for the graph shown above?
a. 4
b. 8
c. 12
d. 16

102. For the graph shown in the given figure, one set of fundamental cut-sets would be



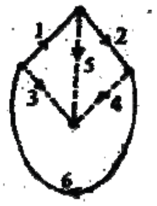
a. abc; cde, afe
b. afdc, cde, abde
c. cbfe, afe, bdf
d. cbd. abde. cde

42. Consider a spanning tree of the connected graph:



What is the number of fundamental cut-sets?
a. 15
b. 16
c. 8

80. Consider the graph and tree (dotted) of the given figure:



The fundamental loops include the set of lines

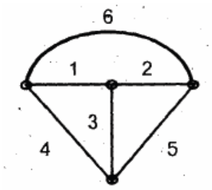
a. (1,5,3), (5, 4, 2) and (3, 4, 6)

b. (1,2,4,3),(1,2,6),(3,4,6)and(1,5,4,6)

c. (1,5,3), (5,4,2), (3,4,6) and (2,4,3,1)

d. (1,2,4,3) and (3, 4, 6)

41. Consider the following graph:



Which one of the following is not a tree of the above graph?

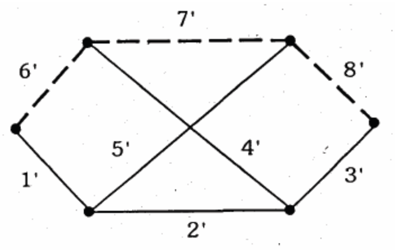
a.

b.

c.

d.

15. Figure given below shows a graph with 6 vertices and 8 edges.



With reference to the above graph, match List I with List II and select the correct answer :

List I

A. Fundamental circuit of chord 6’

B. Fundamental circuit of chord 7’

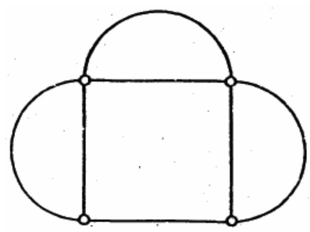
C. Fundamental circuit of chord 8’

List II

1. The edge set (1’, 2’, 4’, 6’)
2. The edge set (2’, 4’, 5’, 7’)
3. The edge set (2’, 3’, 5’, 8’)
4. The edge set (1’, 2’, 4’, 7’)
5. The edge set cannot be determined

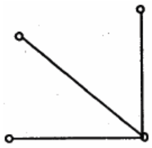
	A	B	C
a.	1	2	3
b.	4	3	2
c.	2	3	4
d.	2	5	3

68.

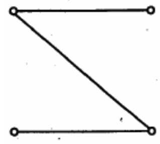


For the network graph shown in the figure given above, which one of the following is not a tree?

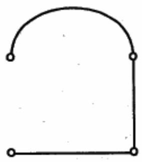
a.



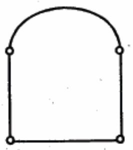
b.



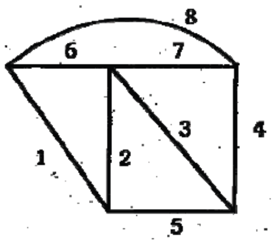
c.



d.



16. In the graph shown in the figure, one possible tree is formed by the branches 4, 5, 6, 7 :



Then one possible fundamental loop is

a. 1, 4, 5

b. 2, 3, 5

c. 3, 4, 8

d. 6, 7, 8

d. 7

Locus Diagrams

72. In a series RLC circuit, the locus of the tip of the admittance phasor in the complex plane as the frequency is varied, is:

a. A semicircle in the upper half of the G-B plane having the centre at $\left(\frac{1}{R},0\right)$ and radius $\frac{1}{R}$

b. A circle in the upper half of the G-B plane having the centre at $\left\{\frac{1}{(2R)},0\right\}$ and radius $\frac{1}{(2R)}$

c. A semicircle in the bottom half of the G-B plane having the centre at $\left\{\frac{-1}{(2R)},0\right\}$ and radius $\frac{1}{(2R)}$

d. A semicircle in the upper half of the G-B plane having the centre at $\left(-\frac{1}{R},0\right)$ and radius $\frac{1}{R}$

110. What is the locus of the tip of the voltage phasor across R in a series R-L-C circuit?

a. A parabola
b. An ellipse
c. A circle
d. A rectangular hyperbola

3-Phase Circuits

19. A balanced RYB-sequence, Y-connected (Star connected) source with V_{RN} = 100 volts is connected to a Δ-connected (Delta connected) balanced load of (8 + j6) ohms per phase. Then the phase current and line current values respectively, are

(a) 10 A; 30 A
(b) $10\sqrt{3}$ A; 30 A
(c) 10 A; 10 A
(d) $10\sqrt{3}$ A; $10\sqrt{3}$ A

59. A 3-phase, 3 wire supply feeds a load consisting of three equal resistors connected in star. If one of the resistors in open circuited, then the percentage reduction in the load will be

a. 75
b. 66.66
c. 50
d. 33.33

76. A 3-phasedelta-connected symmetrical load consumes P watt of power from a balanced supply. If the same load is connected in star to the same Supply, then what is the power consumption?

a. P/3
b. P
c. $\sqrt{3}$/P
d. 3P

45. A balanced delta connected load has an impedance of $9\angle 30°$ ohms per phase. What is the impedance per phase of its equivalent star?

a. $27\angle 30°\Omega$
b. $27\angle 90°\Omega$
c. $3\angle 30°\Omega$
d. $3\angle 20°\Omega$

51. Two resistors of equal value are connected in series across the lines B and C of a symmetrical 3-phase 400 – V system. What is the magnitude of the voltage between the line A and the junction of the resistors?

a. $400/\sqrt{3}$
b. $200\sqrt{3}$
c. $400/3$
d. $100\sqrt{3}$