Electric Circuits and Fields Test 2

Number of Questions: 35 **Section Marks: 90**

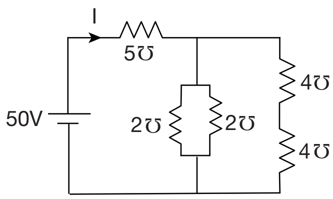
Directions for questions 1 to 35: Select the correct alternative from the given choices.

1. Twelve 1H inductors are used as edges to form a cube. The inductance between two diagonally opposite corners of the cube is

(A) $\frac{5}{6}$H (B) 1H

(C) $\frac{6}{5}$H (D) $\frac{3}{2}$H

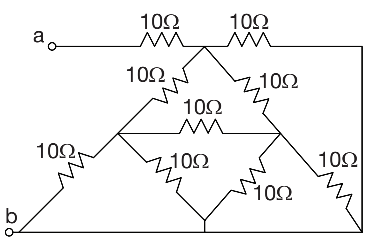
2. Determine the current drawn from the battery of the given figure.



(A) 8.49 A (B) 49.8 A

(C) 36 A (D) 136.36 A

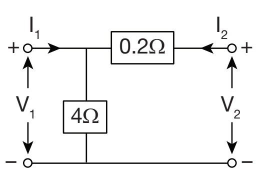
3. Find equivalent resistance between '*a*' and '*b*' terminals.



(A) 6.3Ω (B) 4.3Ω

(C) 14.3Ω (D) 16 3Ω

4. Find Transition matrix of given 2 port network.



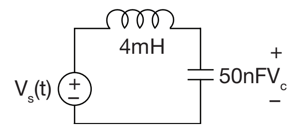
(A) $\begin{bmatrix} 1 & 5 \\ 4 & 21 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 4 \\ 5 & 21 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 0.2 \\ 0.25 & 1.05 \end{bmatrix}$

(D) transition matrix does not exist

5. If $V_c(t) = 5 \sin 10^5 t$ V in below circuit then $V_S(t)$ would be



(A) $5 \sin 10^5 t$ volts (B) $-5 \sin 10^5 t$ volts

(C) zero (D) $-10\cos 10^5\, t$ volts

6. How many Number of tie set matrixes are possible for a graph which has N nodes?

(A) $N^{\frac{N}{2}}$ (B) N^{2N}

(C) N^{N-2} (D) N^{N+2}

7. Two set of Networks are connected in series and each Network contains N number of Resistors each are having R Ω are connected in parallel then find R – equivalence of Total Network?

(A) $\frac{R}{2n}$ (B) $\frac{2R}{n}$

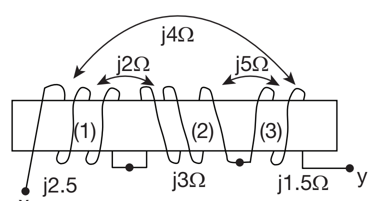
(C) $\left(\frac{R}{n}\right)^2$ (D) $\sqrt{\frac{R}{n}}$

8. A voltage of $V(t)$ = 8sin314t volts is applied to an inductance of 4mH. Determine the instantaneous power (p)

(A) zero (B) –25.48sin 628t W

(C) –6.37 cos314t W (D) –50.96 cos 314t W

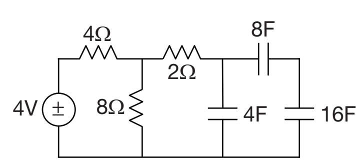
9. Find the net inductance of the iron core coupled coils are in series connection.



(A) j7 H (B) j1 H

(C) j4 H (D) j13 H

10. Find time constant of below circuit



(A) 45.6sec (B) 43.56sec

(C) 53.4sec (D) 54.3sec

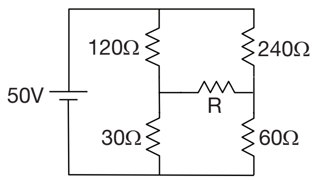
11. A series LCR circuit with $R = 20\Omega$, $|X_L| = |X_c| = 40\Omega$ is connected across an AC supply of 200 V rms. The rms voltage across the inductor is

(A) $200\angle-90°$V (B) $200\angle90°$V
(C) $400\angle-90°$V (D) $400\angle90°$V

12. If half power frequencies are given as 5 KHz, 8 KHz respectively. Then resonance frequency is

(A) 13 KHz (B) 3 KHz
(C) 7 KHz (D) 6.32 KHz

13. Consider the following circuit



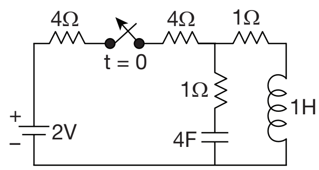
What is the power delivered to resistor R in the above circuit?

(A) 156 watts (B) –156 W
(C) zero (D) 82.52 W

14. The conditions, under which a passive two – port network represented by h if parameters is reciprocal and symmetrical,

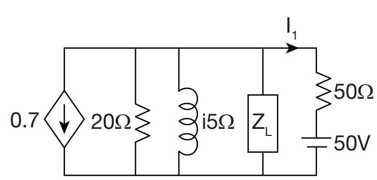
(A) $h_{12} = h_{21}$, $h_{11}h_{22} - h_{12}h_{21} = 1$
(B) $h_{12} = -h_{21}$, $h_{11}h_{22} - h_{12}h_{21} = 1$
(C) $h_{12} = h_{21}$, $h_{11}h_{22} - h_{12}h_{21} = 1$
(D) $h_{12} = -h_{21}$, $h_{12}h_{21} - h_{11}h_{22} = 1$

15. In the circuit shown, the switch is opened at $t = 0$. Then the circuit is



(A) critically damped (B) under damped
(C) over damped (D) undamped

16.



In the given circuit, the maximum power delivered to Z_L if its value is

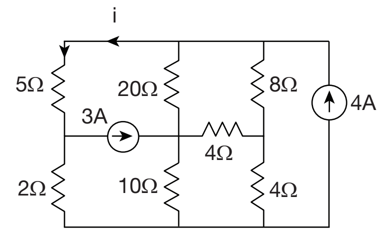
(A) $(0.084 - j0.2)\Omega$ (B) $(0.084 + j0.2)\ \Omega$
(C) $(1.785 - j4.25)\ \Omega$ (D) $(1.785 + j4.25)\ \Omega$

17. 2 – Two port Networks are connected in series with open circuit impedance parameter matrix is $\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and other two port Network has short circuit admittance parameters matrix $\begin{bmatrix} 5 & 10 \\ 4 & 2 \end{bmatrix}$, then find overal twoport network impendence matrix

(A) $\begin{bmatrix} 8 & 14 \\ 8 & 4 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 6 \\ -1 & 0 \end{bmatrix}$

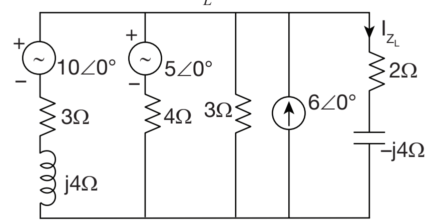
(C) $\begin{bmatrix} 37 & 38 \\ 33 & 54 \end{bmatrix}$ (D) $\begin{bmatrix} 2.933 & 4.333 \\ 5.133 & 1.833 \end{bmatrix}$

18. Find current flowing in 5Ω resistor



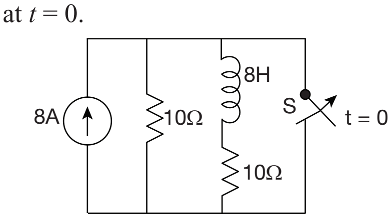
(A) 3.2 A (B) 2.32 A
(C) 1.25 A (D) 6.23 A

19. Find the current in load Z_L in below Network.



(A) $2.43\angle60°$ A (B) $24.3\angle3°$ A
(C) $34.2\angle-30°$ A (D) $43.2\angle60°$ A

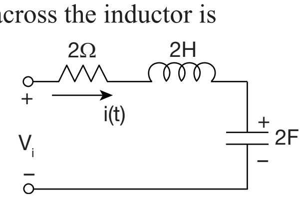
20. Find the voltage across inductor ($t > 0$) where switch is opened at $t = 0$.



(A) $80\,e^{\frac{-10t}{2}}$ V (B) $80e^{\frac{-4t}{5}}$ V

(C) $80e^{\frac{-5t}{2}}$ V (D) zero

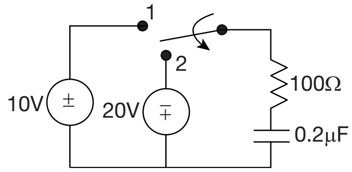
21. The circuit shown below has initial current $i(0^-) = -1$A and initial voltage $V_c(0^-) = 1$V. For unit step response the voltage across the inductor is



(A) $e^{-0.5t}$ V (B) $(2 - 0.5t)\,e^{-0.5t}$ V

(C) $(10 - t)\,e^{-0.5t}$ V (D) $10(2.4 - t)\ e^{\frac{-1}{2}t}$ V

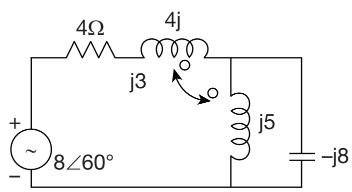
22. Given circuit is attains steady state when the switch at 1 At $t = 0$, the switch is moved to 2. Find energy stored across the capacitor at 0.1m sec



(A) 89.2 μJ (B) 392 μJ
(C) 19.79 μJ (D) 197 μJ

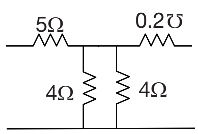
23. Two coupled coils have $K = 0.7$, $N_1 = 400$ turns, $N_2 = 800$ turns and mutual flux being 0.8 wb, if the primary current be 10A, then find the secondary coil inductance
(A) 45.7 H (B) 183 H
(C) 137 H (D) 173 H

24. Find the Voltage drop across the capacitor



(A) 18∠ – 90° (B) 42.1 ∠15.95°
(C) 42.1∠ – 20.5° (D) 21.4 ∠+90°

25. Find h parameters for below 2 port network.



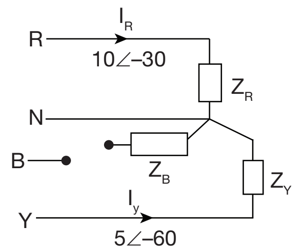
(A) $\begin{bmatrix} -6.428 & 35 \\ -35 & 0.142 \end{bmatrix}$ (B) $\begin{bmatrix} 4.8 & 0.285 \\ 1.4 & 0.142 \end{bmatrix}$

(C) $\begin{bmatrix} 4.8 & 1.4 \\ 0.285 & 0.2 \end{bmatrix}$ (D) $\begin{bmatrix} 6.428 & 0.285 \\ -0.285 & 0.142 \end{bmatrix}$

26. A three phase 440V, 50Hz supply is applied to a balanced delta connected three phase load. The phase currents being $I_{ab} = 20\angle{-30}$. The total power received by the load is
(A) 6.6 KW
(B) 22.86 KW
(C) 7.62 KW
(D) 13.19 KW

27. A 25*HP* induction motor is supplied from a. 400V, 3 – ∅, 50Hz. System. The efficiency being 95% and the power factor of operation is 0.85. The total power is
(A) 23.09KVA
(B) 19.63KVA
(C) 19.63KW
(D) 23.09KW

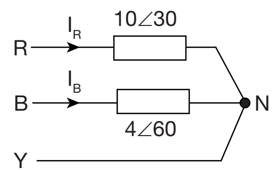
28. The neutral current for the following circuit is



(A) 6.19∠–6.20 A (B) 14.54∠–39.89 A
(C) 6.19∠6.20 A (D) 14.54∠39.89 A

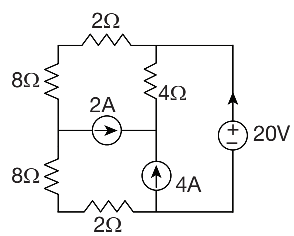
29. Three identical resistances are connected in a star fashion against a balanced three phase voltage supply. If one of the resistances be removed, the power can be.
(A) remains same (B) reduced by 50%
(C) Increases by 50% (D) None of the above

30. A 3∅, 200V, 50Hz supply, a 3 – ∅ load as shown in the figure. The expression for I_R is



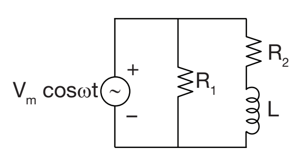
(A) $-20\sqrt{2}\sin(314t + 90°)$ A
(B) $-20\sin(314t + 90°)$ A
(C) $-20\sqrt{2}\sin(314t - 90°)$ A
(D) $-20\sin(314t - 90°)$ A

31. Find the power delivered by the voltage source is



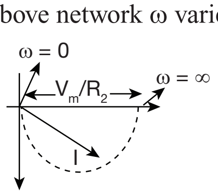
(A) 80 W (B) 20 W
(C) 40 W (D) – 80 W

Common data for Questions 32 and 33:

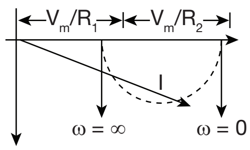


32. In above network ω varies then locus of total current

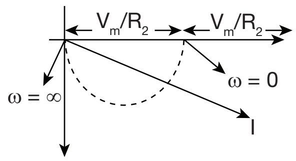
(A)



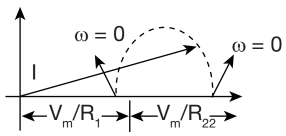
(B)



(C)

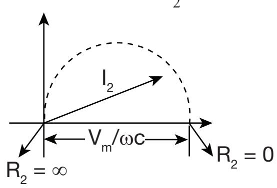


(D)

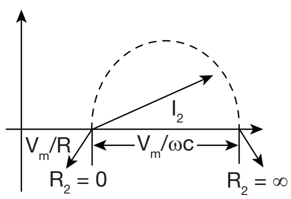


33. In the above circuit inductor is replaced by a capacitor and instead of ω if R_2 is varied then locus of I_2 current.

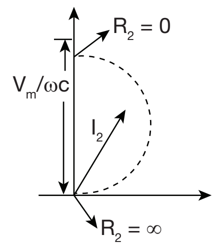
(A)



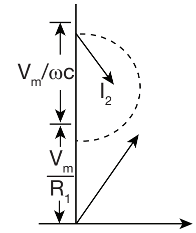
(B)



(C)

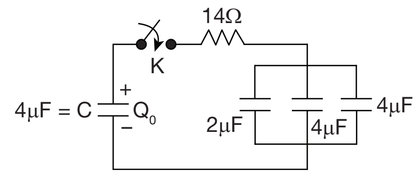


(D)



Statement for Linked Answer Questions 34 and 35:

A 4μF capacitor is initially charged with 600μC. At $t = 0$, the switch is closed.



34. Determine the voltage drop across resistor at $t < T$ where T is time constant.

(A) $600\ e^{-25 \times 10^3 t}$ V

(B) $600\ e^{-14 \times 10^3 t}$ V

(C) $150\ e^{-25 \times 10^3 t}$ V

(D) $150\, e^{-14 \times 10^3 t}$ V

35. Find voltage drop across resistor at 40μsec

(A) 22 V (B) 339 V

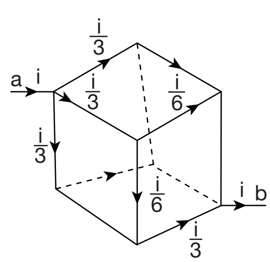
(C) 55.18 V (D) 85 V

Answer Keys

1. A	**2.** D	**3.** C	**4.** C	**5.** B	**6.** C	**7.** B	**8.** B	**9.** B	**10.** B
11. D	**12.** D	**13.** C	**14.** B	**15.** C	**16.** C	**17.** D	**18.** B	**19.** A	**20.** C
21. B	**22.** A	**23.** B	**24.** C	**25.** D	**26.** B	**27.** A	**28.** B	**29.** B	**30.** A
31. D	**32.** B	**33.** C	**34.** C	**35.** C					

Hints and Explanations

1.



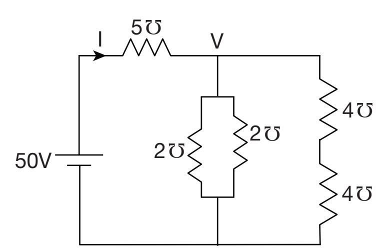
$$V_{ab} = \frac{1}{3}\frac{di}{dt} + \frac{1}{6}\frac{di}{dt} + \frac{1}{3}\frac{di}{dt}$$

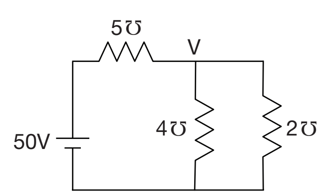
$$= \frac{5}{6}\frac{di}{dt}$$

$$\text{Leq} = \frac{5}{6}\ \text{H}$$

Choice (A)

2.





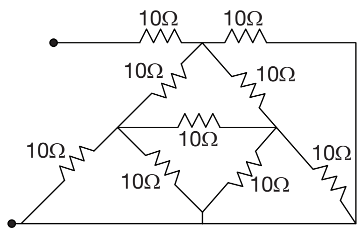
$(V - 50)\ 5 + V\ 4 + 2\ \text{V} = 0$

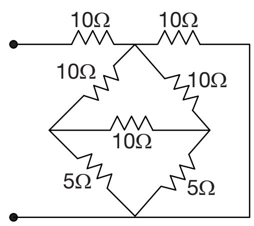
$11\ \text{V} = 250$

$V = \dfrac{250}{11}$

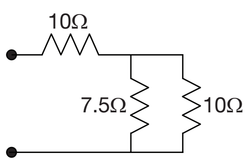
$i = \left(50 - \dfrac{250}{11}\right) 5 = 136.36 \text{ A}$ Choice (D)

3.



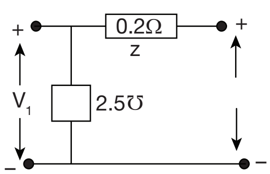


$\Rightarrow$ from bridge balance



$= R_{ab} = 14.28\Omega$ Choice (C)

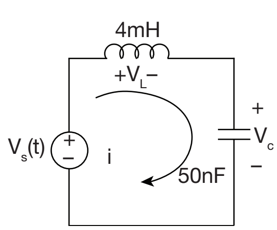
4.



$\Rightarrow \begin{bmatrix} 1 & z \\ y & zy+1 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 1 & 0.2 \\ 0.25 & 1.05 \end{bmatrix}$ Choice (C)

5. If $V_c(t) = 5 \sin 10^5 t\ V$ in below circuit then $Vs\,(t)$



$i_c = i = \dfrac{Cdv_c}{dt}$ where$(V_c) = 5 \sin 10^5 t$

$= 50 \times 10^{-9} \times 5\ 10^5 \cos 10^5\ t = 25 \cos 10^5 t$ mA

$V_S = V_L + V_C$

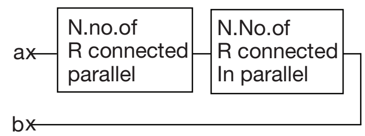
$V_L = L\dfrac{di}{dt} = 4 \times 10^{-3}\ 25 \times 10^5 \sin 10^5\ t \times 10^{-3}$

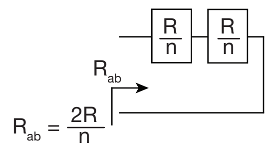
$= -10 \sin 10^5\ t$

$V_s = -5 \sin 10^5 t$ volts. Choice (B)

6. Choice (C)

7.





$R_{ab} = \dfrac{2R}{n}$ Choice (B)

8. Current through the inductance is

$I = \dfrac{1}{L}\int V dt = \dfrac{10^3 x 8}{4}\int \sin\ 314\ tdt$

$= 2\ x\ 10^3 \left[\dfrac{-\cos 314t}{314}\right]$

$= -6.37 \cos 314\ t$ amps

Instantaneous power

$P = Vi = (8 \sin 314\ t)\ (-\ 6.37 \cos 314\ t)$

$= -\ 50.96 \sin 314\ t \cos 314\ t$

$= -\ 25\ .48 \sin 628t$ W Choice (B)

9. $L_1 = j2.5\Omega$; $M_{12} = j2\Omega$

$L_2 = j3\Omega$; $M_{23} = j5\Omega$

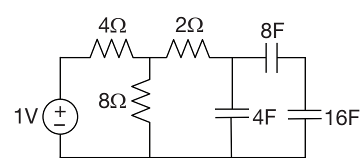
$L_3 = j1.\ 5\Omega$; $M_{13} = j4\ \Omega$

Net inductance is $L_1 + L_2 + L_3 - 2M_{12} - 2M_{23} + 2M_{13}$

$= j(\ 2.5 + 1.5 + 3\ ) - 2\ x\ j2 - 2\ X\ j\ 5 + 2\ (j\ 4)$

$= j7 - j4 - j10 + j8 = j1$H Choice (B)

10. Find time constant of below circuit



$T = R_{eq}.c_{eq}$

$= (4//8 + 2)\ (4 + 8//16) = \dfrac{28}{3} \times \dfrac{14}{3} = 43.\ 56$ sec

Choice (B)

11. Quality factor

$Q = \dfrac{|x_L|}{R} = \dfrac{|x_c|}{R} = 2$

rms voltage across inductor

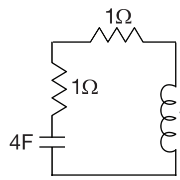
$V_{Lrms} = QV\ \angle 90° = 400\ \angle 90°$ Choice (D)

12. $f_r = \sqrt{f_1\ f_2} = \sqrt{5x8} = 6.32$ KHz Choice (D)

13. It is balanced wheat stone bridge. The current through R is zero so power delivered to R is zero Choice (C)

14. Choice (B)

15. At $t = 0$ when the switch is opened then the circuit can be redrawn as



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

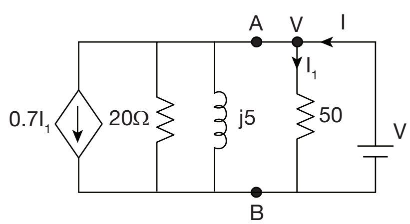
$R = 1 + 1 = 2\Omega$

$L = 1H$

$C = 4F$

$$\xi = \frac{2}{2}\sqrt{\frac{4}{1}} = 2 > 1$$ Choice (C)

16. maximum power delivered to open circuit Z



$$I_1 = \begin{bmatrix} 7 & 2 \\ 2 & 7 \end{bmatrix} \Rightarrow \text{KCL at node } V$$

$$\frac{V}{20} + \frac{V}{j5} + \frac{V}{50} + 0.7I_1 = I$$

$$V\left[\frac{1}{20} + \frac{1}{50} + \frac{0.7}{50} - \frac{j}{5}\right] = I$$

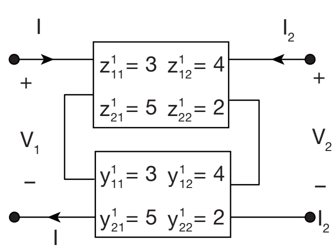
$$\frac{I}{V} = \left[\frac{1}{20} \times \frac{1.7}{50} - \frac{j}{5}\right] = (0.084 - j\,0.2)$$

$$\frac{V}{I} = Z_{th} = \frac{1}{(0.084 - j0.2)} = (1.785 + j4.25)\Omega$$

But $Z_L = Z_{th}^*$

$Z_L = (1.785 - j4.25)\ \Omega$ Choice (C)

17.



$zeq = [Z_1] + [Z_2]$

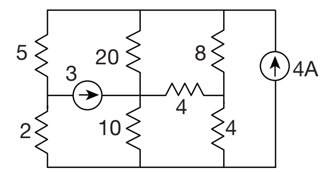
$\rightarrow$ Convert y matrix in to Z – matrix

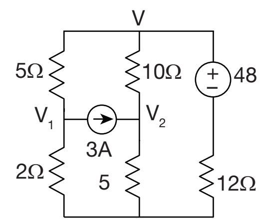
$$[Z_2] = [y_2]^{-1} = \begin{bmatrix} 5 & 10 \\ 4 & 2 \end{bmatrix}^{-1} = \begin{bmatrix} 2 & -10 \\ -4 & 5 \end{bmatrix} \times \frac{1}{-30}$$

$$\Rightarrow \quad Z_{eq} = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix} + \begin{bmatrix} \frac{-1}{15} & \frac{1}{3} \\ \frac{2}{15} & \frac{-1}{6} \end{bmatrix}$$

$$= \begin{bmatrix} 2.933 & 4.333 \\ 5.133 & 1.833 \end{bmatrix}$$ Choice (D)

18.





$\Rightarrow$ Kcl at V

$$\frac{V - V_2}{10} + \frac{V - V_2}{10} + \frac{V - V_1}{5} = 0$$

$23\ V = 6\ V_2 + 12V_1 + 240$

KCL at V_1, $\dfrac{V_1}{2} + \dfrac{V_1 - V}{5} = 3$

$7V_1 - 2V = 30$ (2) $\Rightarrow V_1 = \dfrac{30 + 2V}{7}$

KCL at V_2, $3 = \dfrac{V_2 - V}{10} + \dfrac{V_2}{5}$

$15V_2 - 5\ V = 150$

$3V_2 - V = 50$ $\rightarrow$ (3)

$$\frac{50 + V}{3} = V_2$$

$$\Rightarrow \quad 23\ V = 6\left(\frac{50 + V}{3}\right) + 12\left(\frac{30 + 2V}{7}\right) + 240$$

$$V\left[23 - \frac{6}{3} - \frac{24}{7}\right] = 100 + \frac{360}{7} + 240$$

$$\frac{123V}{7} = \frac{2740}{7}$$

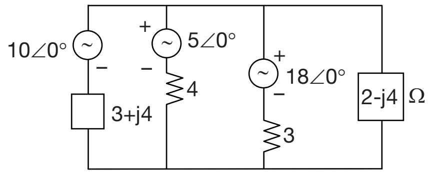
$V = 22.3$

$V_1 = 10.65$

$5i = V - V_1$

$$i = \frac{V - V_1}{5} = 2.32\ A$$ Choice (B)

19. redrawing given circuit



According to millman's theorem

$$V = \frac{V_1Y_1 + V_2Y_2 + V_3Y_3}{Y_1 + Y_2 + Y_3}$$

$$E = \frac{\frac{10}{3+j4} + \frac{5}{4} + \frac{18}{3}}{\frac{1}{3+j4} + \frac{1}{4} + \frac{1}{3}}$$

$$= \frac{\frac{10(3-j4)}{5} + \frac{5}{4} + \frac{18}{3}}{\frac{3-j4}{5} + \frac{1}{4} + \frac{1}{3}} = \frac{6 - j8 + 6 + 1.25}{\frac{71}{60} - \frac{j48}{60}}$$

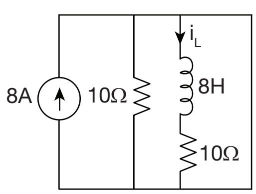
$$= \frac{(13.25 - j8)60}{71 - j48} = \frac{15.48\angle -31 \times 60}{85.7\angle -34}$$

$E = 10.83\angle{-3°}$

$$i_{ZL} = \frac{E}{Z_L} = \frac{10.88\angle -3°}{2 - j4} = \frac{10.88\angle -3°}{4.47\angle -63°} = 2.43\angle 60° \text{A}$$

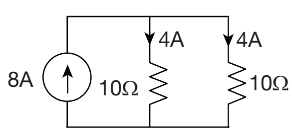
Choice (A)

20.



$i_L = 0$ at $t = 0^-$

at $t \Rightarrow \infty$



$i_L = 4\text{A}$

$$T = \frac{L}{R} = \frac{8}{20} = 0.4$$

$$i_L = 4 + (0 - 4)\ e^{-\frac{t}{0.4}} = 4\left(1 - e^{\frac{-5t}{2}}\right)$$

$$V_L = \frac{Ldi_L}{dt} \text{ volts. } = 8 \times 4 \times \frac{5}{2} e^{-\frac{5t}{2}}$$

$V_L = 80\, e^{\frac{-5t}{2}}$ V

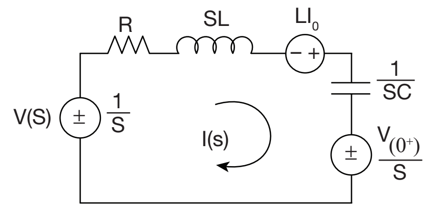
Choice (C)

21. From the given data

$I(0^-) = -1\text{A}$ and $V_c(0^-) = 1\text{V}$.

$V_i(t) = u(t)$ volts.

Converting the given circuit into S-Domain. It becomes.



Applying KVL

$$\therefore \quad \frac{1}{S} = \left(R + SL + \frac{1}{SC}\right) I(S) - L\,I_0 + \frac{V_0}{s}$$

$$\frac{1}{S} = \left(2 + 2s + \frac{1}{2s}\right) I(s) + 2 + \frac{1}{s}$$

$$I(s) = \frac{-2 \times 2s}{4s^2 + 4s + 1} = \frac{-s}{s^2 + s + \frac{1}{4}}$$

$$I(s) = \frac{-s}{\left(s + \frac{1}{2}\right)^2}$$

$$V_L = L.\frac{di}{dt(t)}$$

$$I(s) = \frac{A}{s + \frac{1}{2}} + \frac{B}{\left(s + \frac{1}{2}\right)^2}$$

$$B \text{ at } s = -\frac{1}{2}$$

$$B = \frac{1}{2}.$$

$$-s = A\ (s + \left(s + \frac{1}{2}\right) + B.$$

Compare both sides S^1 terms.

$A = -1$.

$$\therefore \quad I(s) = \frac{-1}{(s+2)} + \frac{\left(\frac{1}{2}\right)}{\left(s + \frac{1}{2}\right)}$$

$$I(t) = \left\{-e^{-\frac{1}{2}t} + \frac{1}{2}te^{-\frac{t}{2}}\right\} wts.$$

$$V_{2(t)} = L.\frac{di(t)}{dt} = 2\left\{\frac{d}{dt}\left\{-e^{-\frac{1^t}{2}}\right\} + \frac{d}{dt}\left\{t.e^{-\frac{1}{2}t}\right\}\right\}$$

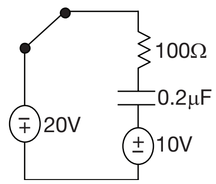
$$= e^{-\frac{1}{2}t} + t\left\{-\frac{1}{2}.e^{-\frac{1}{2}t}\right\} + e^{-\frac{1}{2}}.1$$

$V_L(t) = (2.e^{-0.5t} - 0.5t.\ e^{-0.5t})$

$V_L(t) = \{2 - 0.5t\}.\ e^{-0.5t}.\ V(t).$

Choice (B)

22. From the given data $V_c(0^+) = 10V_{C}.(0^-)$ for $t \geq 0$. the circuit becomes.



$V_c(\infty) = 30$V.

$\tau = RC = 100 \times 0.2 \times 10^{-6} = 20 \ \mu$ sec

$V_c(t) = V_c(\infty) + \{V_c(0^+) - V_c(\infty)\}.\ e^{-t/\tau}$ volts

$= 30–20.\ e^{-50\times10^3 t}$ volts

at $t = 0.1$in sec.

$V_c = 30 – 20.\ e^{-5}$

$= 29.86$

$E = \frac{1}{2}CV^2 = \frac{1}{2} \times 0.2 \times 10^{-6} \times 892$

$\approx 89.2\ \mu$J Choice (A)

23. Let ϕ_1= primary flux ;ϕ_{12} mutual flux, K co-efficient of coupling I_1=10 A

$\phi_{12} = K\,\phi \Rightarrow 0.8 = 0.7\ \phi_1$

$\Rightarrow \quad \phi_1 = 1.1428$

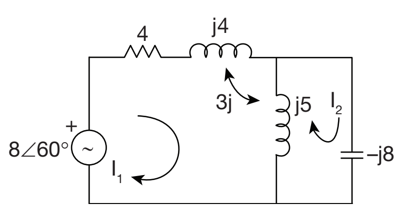
$L_1 = = \frac{N_1\varphi_1}{I_1} = \frac{400 \times 1.1428}{10} = 45.7$H

$M = K\sqrt{L_1L_2}$

$N_2 = \frac{\varphi_{12}}{I_1} = M = 800 \times \frac{0.8}{10}$

$\Rightarrow \quad 6\ 4 = 0.7\sqrt{45.7L_2} \Rightarrow L_2 = 183$H Choice (B)

24.



Applying KVL in loop 1

$8\angle60° = 4I_1 + j4I_I + j5\ (I_1 – I_2) – j_3\ (I_1 – I_2)$

$8\angle60° = I_1\,(4 + j6) – j2I_2$

Apply KVL in loop 2

$j5\ (I_2 – I_1) – j8\ I_2 – j3\ I_1 = 0$

$\Rightarrow \quad I_1\,8j = 3j\ I_2$

$I_1 = \frac{3}{8}\ I_2 \Rightarrow 8\angle60° = I_2\left(\frac{3}{8}(4 + j6) - 2j\right)$

$8\angle60°\ I_2\left(\frac{3}{2} - \frac{j}{4}\right)$

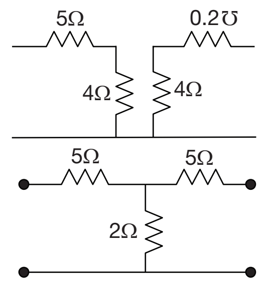
$I_2 = \frac{8\angle60°}{1.52\angle-9.5°} = 5.263\angle69.5°$

Drop across capacitors is $(–j8) \times (5.263\angle69.5°)$

$= 8\angle–90° \times 5.263\angle69.5 = 42.1\angle – 20.5°$

Choice (C)

25.



Z matrix is $\begin{bmatrix} 7 & 2 \\ 2 & 7 \end{bmatrix}$

Converting zmatrix in h parameter

$h_{11} = \frac{Z_{11}Z_{22} - Z_{12}Z_{21}}{Z_{22}} = 6.428\Omega$

$h_{12} = \frac{Z_{12}}{Z_{22}} = \frac{2}{7} = 0.285$

$h_{21} = \frac{-Z_{12}}{Z_{22}} = \frac{-2}{7} = 0.285$

$h_{22} = \frac{1}{Z_{22}} = \frac{1}{7} = 0.142$

$\Rightarrow \quad h$ matrix is $\begin{bmatrix} 6.428 & 0.285 \\ -0.285 & 0.142 \end{bmatrix}$ Choice (D)

26. Total power received by the load $= 3V_{ph}I_{ph}\cos\phi$

$= 3 \times 440 \times 20 \times \cos 30 = 22.863$ KW Choice (B)

27. Power input $= \frac{25 \times 746}{0.95} = 19.63$ KW

Total power (or) apparent power $= \frac{19630}{0.85}$

$= 23.09$ KVA Choice (A)

28. $I_N = I_{R+}I_Y$

$= 10\angle–30 + 5\angle–60$

$= 14.54\angle–39.89$ A Choice (B)

29. $P_1 = \frac{3v_{pn}^2}{R}$

$= \frac{V_L^2}{2R}$

$P_2 = \frac{V_L^2}{2R}$

Power $= \frac{\frac{V_L^2}{R} - \frac{V_L^2}{2R}}{\frac{V_L^2}{R}} \times 100 = 50\%$ Choice (B)

30. $V_{RB} = 200\angle 0.V$

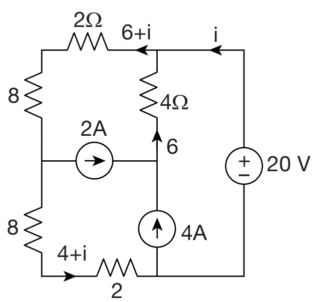
$V_{BY} = 200\angle -120V$

$V_{YR} = 200\angle +120V$

$$I_R = \frac{-V_{YR}}{Z_R} = \frac{-200\angle 120}{10\angle 30} = -20\angle 90$$

$I_R = -20\sqrt{2}\sin(314t + 90)$A. Choice (A)

31. Given Network is



Apply KVL

$20 = 10(6 + i) + 10(4 + i)$

$20 = 10[10 + 2i]$

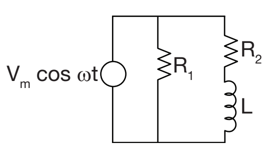
$2 = 10 + 2i$

$\Rightarrow \quad 2i = -8$

$i = -4$

Power = $20 \times -4 = -80$ W Choice (D)

32.

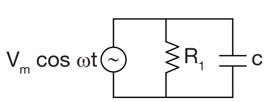


$$I = I_1 + I_2$$

$$= \frac{V_m\angle 0°}{R_1} + \frac{V_m\angle 0°}{R_2 + j\omega L}$$

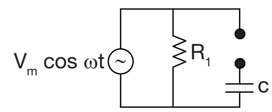
$$\frac{V_m\angle 0°}{R_1} + \frac{V_m}{\sqrt{R^2 + \omega^2\ c^2}} - \tan^{-1}\left(\frac{\omega L}{R}\right)$$ Choice (B)

33.



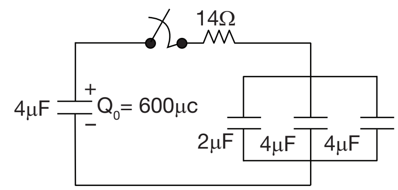
If $R_2 = 0$

$$I_2 = \frac{E_m}{\frac{1}{\omega C}}\angle -90° = E_m\omega C\angle -90°$$



If $R_2 = \infty$ $I_2 = 0$ Choice (C)

34. Given circuit is



$T = RC_{eq}$

$= 14\ (10//4)\ x\ 10^{-6}$

$= 14\ x\ \dfrac{20}{7}\ x\ 10^{-6}$

$= 40\ \mu$ sec

The initial voltage V_0 across capacitor c_o is given as

$$V_0 = \frac{Q_0}{C_0}$$

$$= \frac{600X10^{-6}}{4X10^{-6}}$$

$= 150$ V

→ With closing of k_1 the capacitor C_o will start discharging, & at $t = 0^+$ there will be no voltage across 2 μ F, 4μF, 4μF, because at $t = 0^-$ switch is opened. So the entire voltage drop across R at $t = 0^+$ time

$V_R = V_0 e^{-t/RC}$

$= 150\ e^{\frac{-t}{40x10^{-6}}}$

$= 150\ e^{-25\ x\ 10^{3}t}$ V Choice (C)

35. $V_R = 150\ e^{-25\times 10^3 \times 40\times 10^{-6}}$

$= 150\ e^{-1}$

$= 55.18$ V Choice (C)