CLASS TEST

S.N. : 03_SK_ABCD_04092022

MADE EASY

India's Best Institute for IES, GATE & PSUs

Delhi | **Bhopal** | **Hyderabad** | **Jaipur** | **Lucknow** | **Pune** | **Bhubaneswar** | **Kolkata** | **Patna**

Web: www.madeeasy.in | **E-mail:** info@madeeasy.in | **Ph:** 011-45124612

NETWORK THEORY

ELECTRICAL ENGINEERING

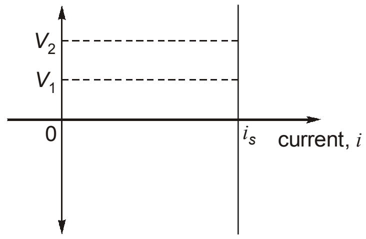
Date of Test : 04/09/2022

ANSWER KEY

1.	(c)	7.	(d)	13.	(c)	19.	(c)	25.	(a)
2.	(a)	8.	(c)	14.	(a)	20.	(b)	26.	(b)
3.	(b)	9.	(c)	15.	(d)	21.	(d)	27.	(d)
4.	(a)	10.	(d)	16.	(b)	22.	(a)	28.	(b)
5.	(b)	11.	(a)	17.	(b)	23.	(b)	29.	(c)
6.	(b)	12.	(d)	18.	(b)	24.	(a)	30.	(b)

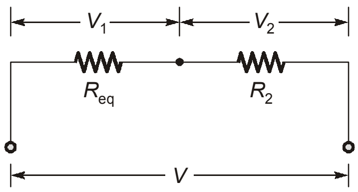
DETAILED EXPLANATIONS

1. (c)
The ideal independent current source is a two terminal element which supplies its specified current to the circuit in which it is placed independently of the value and direction of the voltage appearing across its terminals.



2. (a)
When switch s is closed, the equivalent resistance

$$R_{eq} = \left(\frac{R_1 \times R_3}{R_1 + R_3}\right) \text{ is less than } R_1 \text{ or } R_3 \text{ individually}$$



$$V = IR$$

for constant current, $V \propto R$.
So incase of R_{eq}, the resistance is decreased so voltage V_1 is decreased so obviously V_2 is increased.

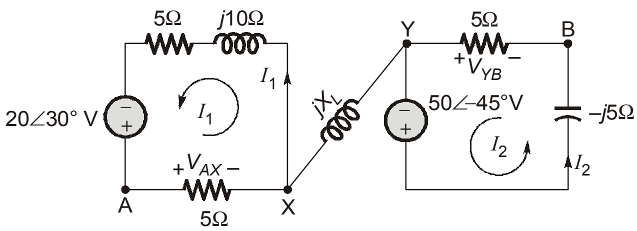
3. (b)

Across the load Z_L, $\quad Z_{TH} = \dfrac{(-j40)(80 + j100)}{80 + j60} = 12.8 - j49.6\ \Omega$

For maximum average power transfer

$$Z_L = Z_{TH}^*,$$
$$\therefore \quad Z_L = 12.8 + j49.6 \text{ W}$$

4. (a)
The given figure with current direction is shown below.



We can notice that no current will flow through the inductor jX_L.
Thus, $\quad V_{XY} = 0$ V

Now, using KVL, from mesh-1, we have:

$$I_1 = \frac{20\angle 30°}{10 + j10} = 1.414\angle -15° A$$

Using KVL, from mesh-2

and $$I_2 = \frac{50\angle -45°}{5 - j5} = 7.07\angle 0° A$$

Thus, $V_{AX} = I_1 (5) = (1.414 \angle -15°) \times 5$

$V_{AX} = 7.07 \angle -15°$ V

and $V_{YB} = -I_2(5) = -(7.07 \angle 0°)\ 5$

$= -35.35 \angle 0°$ V

Hence, $V_{AB} = V_{AX} + V_{XY} + V_{YB} = V_A - V_B$

$= 7.07 \angle -15° + 0 - 35.35 \angle 0°$

$V_{AB} = -28.52 - j1.83 = 28.579\angle -176.3°$ V $\approx 28.6 \angle 183.7°$ V

5. (b)

Since the network is passive, current I is due to the two sources V_1 and V_2.

By principle of superposition,

$I = K_1V_1 + K_2V_2$

$1 = 4K_1 + 0$

$K_1 = 0.25$

and $-1 = 0 + 5K_2$

$$K_2 = \frac{-1}{5} = -0.2$$

Given, $V_1 = 10$ V

and $V_2 = 5$ V

Current, $I = (10 \times 0.25) + (5 \times -0.2)$

$I = 2.5 - 1 = 1.5$ A

6. (b)

From given figure, we have:

$$I_{\Delta ph} = \frac{V_{ph}}{100\Omega} = \frac{400}{100} = 4\text{A}$$

Therefore, $P_\Delta = 4^2 \times 100$

$P_\Delta = 1600$ W

For star connected resistors,

$$P_Y = 3I_{ph}^2 R$$

Now, $$I_{Yph} = \frac{V_{Y\,ph}}{R}$$

$$I_{Yph} = \frac{400/\sqrt{3}}{R}$$

Given, $P_\Delta = P_Y$

or, $$1600 = \left(\frac{400/\sqrt{3}}{R}\right)^2 \times 3 \times R$$

or, $$R = 100\ \Omega$$

7. (d)

For calculation of R_{Th}, the circuit can be redrawn as

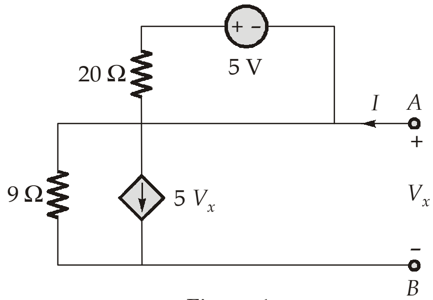


Figure-1

≡

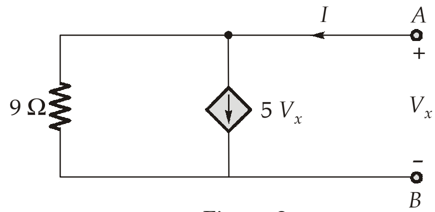


Figure-2

Using KCL in figure-2, we get,

$$\frac{V_x}{9} + 5V_x = I$$

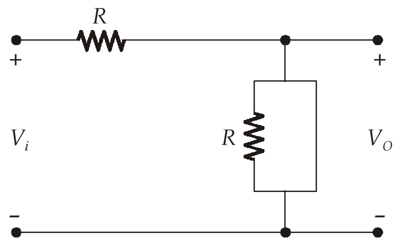
$$46V_x = 9I$$

or $$\frac{V_x}{I} = \frac{9}{46} = 0.195\ \Omega \approx 195.65\ \text{m}\Omega$$

8. (c)

At $\omega \to \infty$, Capacitor $\to$ short circuited

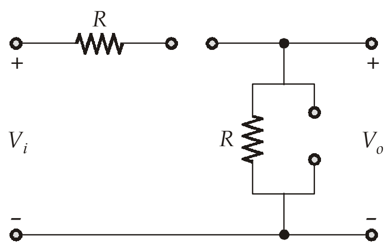
Circuit looks like,



$$\frac{V_o}{V_i} = 0$$

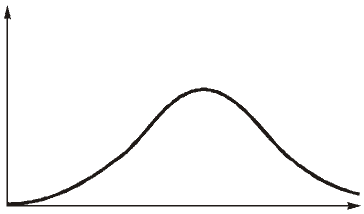
At $\omega \to 0$, Capacitor $\to$ open circuited

Circuit looks like



$$\frac{V_0}{V_i} = 0$$

So frequency response of the circuit will be,



So the circuit is Band pass filter

9. **(c)**

Current is lagging voltage by 53.13°,

i.e. $\phi = 53.13°$

$\therefore$ the elements will be R and L

$$\tan\phi = \frac{\omega L}{R}$$

$$\tan(53.13°) = 1.33 = \frac{5000L}{R} \quad \text{...(i)}$$

[Since ω = 5000 rad/sec]

$$\frac{V}{I} = |Z| = \frac{50}{10} = \sqrt{R^2 + (\omega L)^2}$$

$$5 = \sqrt{R^2 + (\omega L)^2}$$

$$25 = R^2 + (5000L)^2 \quad \text{...(ii)}$$

From equation (i),

$$L = \frac{R \times 1.33}{5000} \text{ substituting in equation (ii),}$$

$$25 = R^2 + (R\ 1.33)^2$$

$$R = 3\ \Omega$$

Substituting in equation (ii), we get

$$L = \frac{3 \times 1.33}{5000} = 0.8 \text{ mH}$$

10. **(d)**

From the first circuit

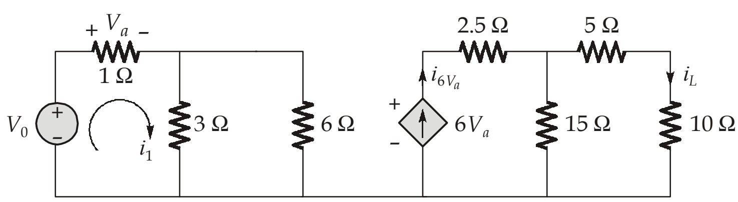
$$V_0 = i_1\left[1 + \frac{3 \times 6}{3 + 6}\right] = 3i_1 \quad \text{...(i)}$$

From the second circuit,

$$\text{Power across } 10\ \Omega = 90 \text{ W.}$$

$$i_L^2 \times 10 = 90$$

$$i_L = \sqrt{9} = 3\text{A.}$$



$$6V_a = 2i_L = 2 \times 3 = 6 \text{ A}$$

Hence $\quad 6V_a = 6$

$$V_a = 1\text{ V}$$

From the figure, $V_a = i_1 \times 1 = i_1$

So, $i_1 = 1\text{ A}$

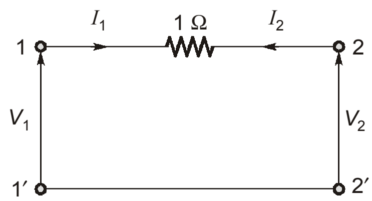
From equation (i), $V_0 = 3i_1 = 3 \times 1 = 3\text{ V}$

11. (a)

For parallel connected 2 ports.

$$[Y] = [Y_1] + [Y_2]$$

$$\because \quad [Y_1] = \begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$$



$$I_1 = -I_2$$

$$V_1 = I_1 + V_2$$

or $I_1 = V_1 - V_2$ ...(i)

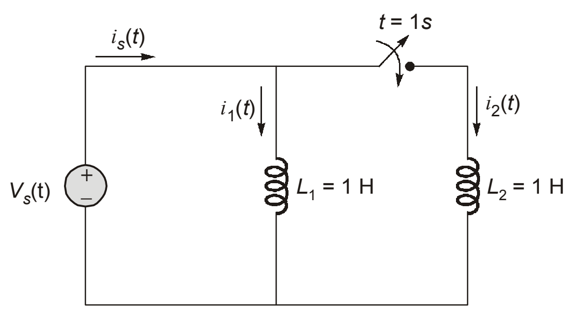
and $I_2 = V_2 - V_1$ ...(ii)

or, we can write $[Y_2] = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$

Now $[Y] = \begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 5 & 1 \\ 0 & 2 \end{bmatrix}$

12. (d)

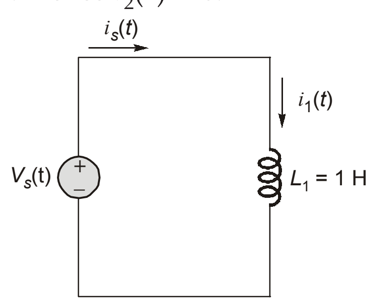
The initial conditions on the inductors, since no voltage is applied to either inductor for $t < 0$.



$\Rightarrow \quad i_1(0) = i_2(0) = 0$

Further, no voltage appears across the second inductor until $t \geq 1$. Hence $i_2(1) = 0$.

$\Rightarrow i_1(t)$ for $0 \leq t \leq 1$;



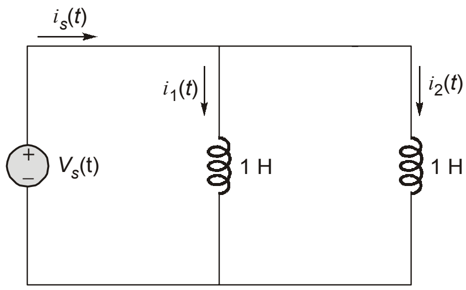
$$i_s(t) = i_1(t) = \frac{1}{L_1}\int_0^t V_s(t)\,d(t)$$

$$= \int_0^t \cos(t)\,d(t)$$

$$i_s(t) = i_1(t) = \sin(t) \text{ A} \qquad (\text{for } t < 1)$$

At $t = 1$, the switch is closed. The two inductors are then in parallel as shown below and the source voltage appears across each.

$\Rightarrow$ $i_1(t)$ and $i_2(t)$ for $t \geq 1$;



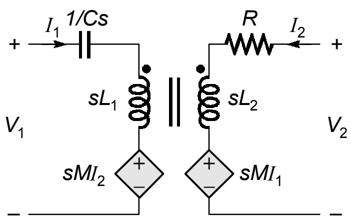
$$i_1(t) = i_1(1) + \int_1^t \cos(t)dt = \sin(1) + \sin(t) - \sin(1) = \sin(t) \text{ A}$$

$$i_2(t) = i_2(1) + \int_1^t \cos(t)dt = \sin(t) - \sin(1) \text{ A}$$

for KCL, the input current $i_s(t) = i_1(t) + i_2(t) = 2\sin(t) - \sin(1)$ A $\qquad$ (for $t \geq 1$)

13. (c)

Drawing equivalent in s-domain



Applying KVL

in loop I

$$V_1 = \left(\frac{1}{sC} + sL_1\right)I_1 + sMI_2$$

in loop II

$$V_2 = sMI_1 + (R + sL_2)I_2$$

comparing with standard equations

$$Z_{11} = \frac{1}{sC} + sL_1 \qquad Z_{12} = sM$$

$$Z_{21} = sM \qquad Z_{22} = R + sL_2$$

14. (a)

The voltage difference across capacitor is

$$V_d = V_a - V_b = \frac{30 \times 10}{30} - \frac{30 \times 2}{20}$$

$$= 10 - 3$$

$$= 7 \text{ V}$$

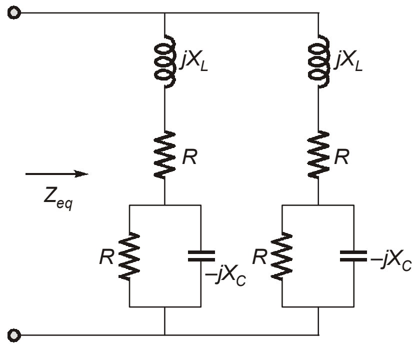
energy stored in capacitor $= \frac{1}{2}CV_d^2 = \frac{1}{2} \times 1 \times 10^{-6} \times 7^2$

$$= 24.5 \ \mu J$$

15. (d)

For current to be in phase with applied voltage imaginary part of impedance should be zero.

Redrawing the circuit



$$Z_{eq} = \frac{(R+jX_L)+(R\|-jX_C)}{2} = \frac{\left(R+jX_L+\frac{-jR\cdot X_C}{R-jX_C}\right)}{2} = \frac{\left(R+jX_L-\frac{jR\cdot X_C}{R^2+X_C^2}(R+jX_C)\right)}{2}$$

equating imaginary part to zero

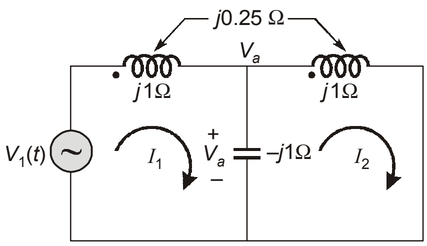
$$\frac{\left(X_L-\frac{R^2X_C}{R^2+X_C^2}\right)}{2} = 0$$

$$R^2X_C = X_L\cdot\left(R^2+X_C^2\right)$$

$$\Rightarrow \qquad X_L = \frac{R^2X_C}{R^2+X_C^2}$$

16. (b)

Redrawing the circuit



$$jI_1 + j\frac{1}{4}I_2 - j(I_1-I_2) = V_1(t)$$

$$j\frac{5}{4}I_2 = V_1(t)$$

$$\Rightarrow \qquad I_2 = j\frac{4}{5}\cdot 2\angle 0° = 1.6\angle -90°\text{A}$$

$$jI_2 + j\frac{1}{4}I_1 - j(I_2-I_1) = 0$$

$$\Rightarrow \qquad I_1 = 0$$

V_a = voltage across capacitor = voltage across inductor L_2

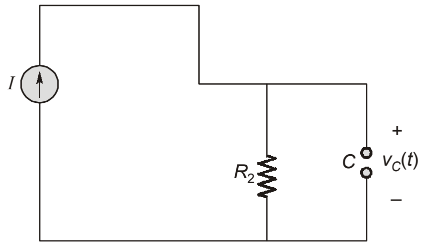
$$= I_2 \times j1 = j \times 1.6 \angle -90°$$

$$= 1.6\angle 0° = 1.6 \cos t \text{ V}$$

17. (b)

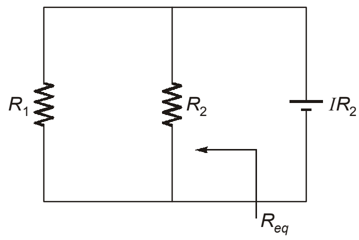
at $t = 0^-$

$$v_C = I \times R_2$$



at $t = 0^+$

$$v_C(0^-) = v_C(0^+) = IR_2$$



$$v_C(\infty) = 0$$

($\because$ capacitor will discharge fully)

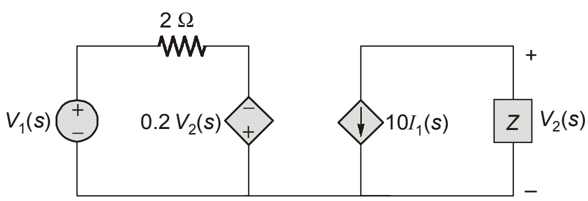
$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

$$v_C(t) = [v_C(0) - v_C(\infty)]e^{-\frac{t}{\tau}} + v_C(\infty)$$

$$v_C(t) = IR_2 \cdot e^{\frac{-t(R_1+R_2)}{R_1 R_2 \cdot C}} \text{ Volts}$$

18. (b)

Redrawing the circuit



$$Z = 1.5s \| 1 = \frac{1.5s \times 1}{1.5s + 1} = \frac{1.5s}{1.5s + 1}$$

Applying KVL in loop I

$$V_1(s) = 2I_1(s) - 0.2\ V_2(s) \qquad \ldots(i)$$

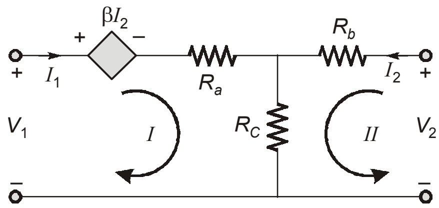
$$V_2(s) = -10I_1(s) \times \frac{1.5s}{1.5\ s + 1}$$

$$V_2(s) = \frac{-15sI_1(s)}{1.5s+1} \quad \text{...(ii)}$$

From equations (*i*) and (*ii*)

$$\text{Input admittance} = \frac{I_1(s)}{V_1(s)} = \frac{1.5s+1}{6s+2}$$

19. (c)



Applying KVL
in loop 1

$$\beta I_2 + (R_a + R_c)I_1 + R_cI_2 = V_1$$

$$V_1 = (R_a + R_c)I_1 + (\beta + R_c)I_2$$

Comparing this with standard equation

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

$$\Rightarrow \quad Z_{12} = \beta + R_c$$

20. (b)

When the switch is at position 1,

$$V_C(0^-) = 100 \text{ V}$$

Voltage across capacitor at $t > 0$

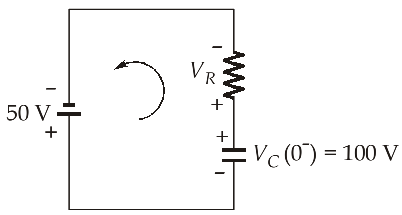
$$V_C = V_\infty - (V_\infty - V_0)e^{-t/\tau}$$

Where, $\tau = RC = 5000 \times 1 \times 10^{-6} = 5$ msec

$$V_C = (-50) - (-50 - 100)e^{-200t}$$

$$V_C = (150\, e^{-200t} - 50) \text{ V}$$

Applying KVL in the loop



$$-V_C + V_R - 50 = 0$$

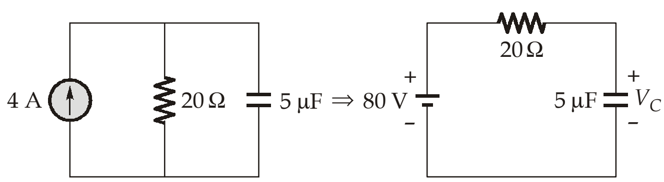
$$V_R = V_C + 50$$

$$= 150\, e^{-200t} - 50 + 50$$

$$V_R = 150\, e^{-200t} \text{ V}$$

21. (d)

The circuit that exists for $t < 0$ is,



$$V = IR = 4 \times 20 = 80 \text{ V}$$

$$\therefore \quad V_c(0^+) = V_c(0^-) = 80 \text{ V}$$

$$\text{Time constant, } \tau = RC = 20 \times 5 \times 10^{-6} = 10^{-4} \, s$$

After $t = 0$,

$$V_c(t) = V_\infty - (V_\infty - V_0)\, e^{-t/\tau}$$
$$= 0 - (0 - 80)\, e^{-t/\tau}$$

$$V_c(t) = 80e^{-10^4 t}$$

The half of initial voltage,

$$\frac{80}{2} = 40 \text{ V}$$

$$\therefore \quad 40 = 80e^{-10^4 t}$$

$$0.5 = e^{-10^4 t}$$

$$\text{Time, } t = 69.3 \text{ μs}$$

22. (a)

$$V_{ab} = V_{\text{Th}}$$

By applying KCL,

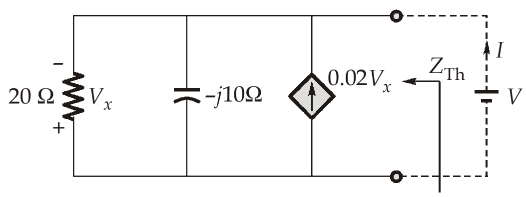
$$\frac{V_{Th} - 100}{20} + \frac{V_{Th}}{-j10} = 0.02\, V_x$$

Where,

$$V_x = 100 - V_{\text{Th}}$$

$$\frac{V_{Th} - 100}{20} + \frac{V_{Th}}{-j10} = 0.02(100 - V_{Th})$$

$$V_{\text{Th}} = \frac{7}{0.07 + j0.1} = 57.34\angle{-55°} \text{ V}$$



$$Z_{\text{Th}} = \frac{V}{I}$$

By apply KCL in the circuit gives,

$$\frac{V}{20} + \frac{V}{-j10} - 0.02V_x = I$$

and,

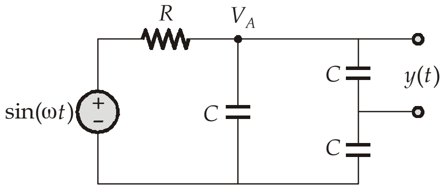
$$V_x = -V$$

$$\therefore \quad \frac{V}{20} + \frac{V}{-j10} + 0.02V = I$$

$$Z_{\text{Th}} = \frac{V}{I} = \left[\frac{1}{\frac{1}{20} + \frac{1}{-j10} + 0.02}\right]$$

$$= (4.7 - j6.7)\Omega$$

23. (b)



Applying KCL at node A, we get

$$\frac{V_A - \sin\omega t}{R} + \frac{V_A}{\frac{1}{j\omega C}} + \frac{V_A}{\frac{2}{j\omega C}} = 0 \quad \text{...(i)}$$

$$V_A\left[\frac{1}{R} + j\omega C + \frac{j\omega C}{2}\right] = \frac{\sin\omega t}{R} = \frac{1\angle 0°}{R}$$

$$V_A = \frac{2}{2 + 3RC \cdot j\omega} \quad \text{...(ii)}$$

Also $$Y = \frac{V_A}{2} = \frac{1}{2 + 3j\omega RC} \quad \text{...(iii)}$$

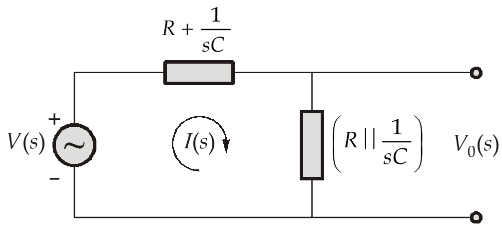
$\because$ $$|A(\omega)| = \frac{1}{4} = 0.25$$

$\therefore$ $$\frac{1}{4} = \frac{1}{\sqrt{4 + 9\omega^2 (RC)^2}}$$

or, $$\omega = \frac{2}{\sqrt{3}\,RC}$$

24. (a)

Redrawing the circuit in s-domain



$$V_i(s) = \left(R + \frac{1}{sC}\right) I(s) + \frac{R \cdot \frac{1}{sC}}{R + \frac{1}{sC}} I(s)$$

$$V_i(s) = \frac{1 + sCR}{sC} I(s) + \frac{R}{1 + sCR} I(s) \quad \text{..(i)}$$

$\because$ $$v_i = V_p \cos(t/RC)$$

So here, $$\omega = \frac{1}{RC}$$

Now, $$V_i(s) = \frac{(1 + j\omega CR)}{j\omega C} I(s) + \frac{R}{(1 + j\omega CR)} I(s)$$

Put, $$\omega = \frac{1}{RC}$$

So, $$V_i(s) = \left[\frac{(1+j)R}{j} + \frac{R}{1+j}\right] I(s)$$

$$\frac{V_i(s)}{I(s)} = \frac{3R}{(1+j)} \qquad \text{...(ii)}$$

$$I(s) = \frac{V_i(s)}{3R} \times (1+j)$$

Now, $$V_0(s) = \left(R \,||\, \frac{1}{sC}\right) I(s)$$

$\Rightarrow$ $$V_0(s) = \frac{R \cdot \frac{1}{sC}}{R + \frac{1}{sC}} I(s)$$

$\Rightarrow$ $$V_0(s) = \frac{R}{1+sCR} \cdot \frac{V_i(s)}{3R}(1+j)$$

$\Rightarrow$ $$V_0(s) = \frac{R}{1+j} \cdot \frac{V_i(s)}{3R}(1+j)$$

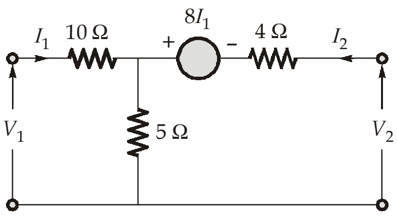
$\Rightarrow$ $$V_0(s) = \frac{V_i(s)}{3}$$

In time domain,

$$v_0(t) = \frac{1}{3} v_i(t)$$

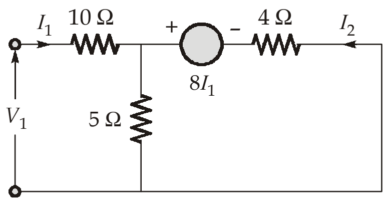
$\Rightarrow$ $$v_0(t) = \frac{V_p}{3} \cos\left(\frac{t}{RC}\right)$$

25. (a)



$$I_1 = Y_{11} V_1 + Y_{12} V_2$$

Short-circuiting port-2 i.e. $V_2 = 0$, we get



Applying KVL in both loops, we get

$$V_1 = 10I_1 + 5I_1 + 5I_2 \qquad \text{...(i)}$$

and $$4I_2 + 5I_2 + 5I_1 - 8I_1 = 0$$

$\Rightarrow$ $$9I_2 = 3I_1$$

$\Rightarrow$ $$I_2 = \frac{I_1}{3} \qquad \text{...(ii)}$$

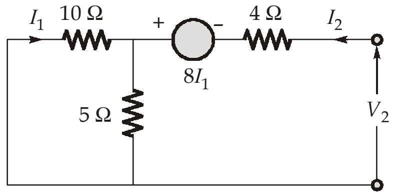
From equations (i) and (ii); we get

$$V_1 = 10I_1 + 5I_1 + \frac{5I_1}{3}$$

$$= 15I_1 + \frac{5I_1}{3} = \frac{50I_1}{3}$$

$$\Rightarrow \quad \left.\frac{I_1}{V_1}\right|_{V_2=0} = Y_{11} = \frac{3}{50}\text{ mho}$$

Short circuiting port-1; i.e. V_1 = 0, we get



Applying KVL in both loops; we have

$$10I_1 + 5I_1 + 5I_2 = 0$$

$$15I_1 = -5I_2$$

$$\Rightarrow \quad I_2 = -3I_1 \qquad \text{...(iii)}$$

and $$V_2 = 4I_2 - 8I_1 + 5I_1 + 5I_2$$

$$\Rightarrow \quad V_2 = 9I_2 - 3I_1$$

$$\Rightarrow \quad V_2 = 9(-3I_1) - 3I_1$$

[Using equation (iii)]

$$\Rightarrow \quad V_2 = -30I_1$$

$$\therefore \quad \left.\frac{I_1}{V_2}\right|_{V_1=0} = Y_{12} = -\frac{1}{30}\text{ mho}$$

26. (b)

The current lags the voltage by 50° – 5° = 45°

$$\therefore \quad \omega L > \frac{1}{\omega C}$$

$$\tan 45° = 1 = \frac{\omega L - \frac{1}{\omega C}}{R}$$

and $$\frac{V_m}{I_m} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2} = \sqrt{R^2 + R^2}$$

$$\frac{100}{10} = \sqrt{2}R$$

or $$R = 7.07\ \Omega$$

$$\because \quad R = \omega L - \frac{1}{\omega C}$$

$$\frac{1}{\omega C} = 314 \times 40 \times 10^{-3} - 7.07$$

$$\frac{1}{\omega C} = 12.56 - 7.07 = 5.49$$

or $$C = \frac{1}{314 \times 5.49} \approx 580\ \mu\text{F}$$

27. (d)

$$Z_L = R \parallel (-jX_C) = \frac{R(-jX_C)}{R-jX_C} = \frac{R(-jX_C)}{R-jX_C} \times \frac{R+jX_C}{R+jX_C}$$

$$= \frac{RX_C^2}{R^2+X_C^2} - j\frac{R^2X_C}{R^2+X_C^2} \quad \text{...(i)}$$

For maximum power transfer $Z_L = Z_s^*$

$\because \quad Z_s = 100 + j200$

$\therefore \quad Z_L = 100 - j200 \quad \text{...(ii)}$

On comparing equation (i) and (ii), we get,

$$\frac{RX_C^2}{R^2+X_C^2} = 100 \quad \text{and} \quad \frac{R^2X_C}{R^2+X_C^2} = 200$$

on solving, we get, $X_C = 250\ \Omega$

$$C = \frac{1}{500X_C} = 8\ \mu\text{F}$$

and $R = 500\ \Omega$

28. (b)

Following switching, the differential equation representing the circuit is,

$$Ri(t) + \frac{1}{C}\int i(t)\,dt = V = 10$$

Taking Laplace transform, we get,

$$I(s) + \frac{I(s)}{2\times10^{-6}s} + \frac{Q_0}{2\times10^{-6}s} = \frac{10}{s} \qquad \because Q_0 = -250\ \mu\text{C}$$

Therefore,

$$I(s) + \frac{I(s)}{2\times10^{-6}s} - \frac{250}{2s} = \frac{10}{s}$$

$$I(s) + \frac{I(s)}{2\times10^{-6}s} = \frac{135}{s}$$

or

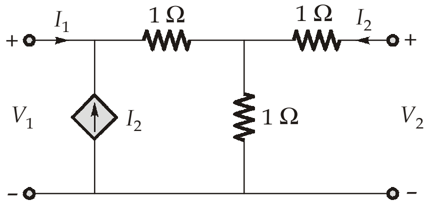
$$I(s) = \frac{135}{(s+5\times10^5)}$$

Taking inverse Laplace transform, we get,

$$i(t) = (135e^{-5\times10^5 t})\ \text{A}$$

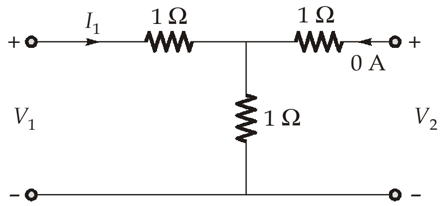
29. (c)

Let us first calculate z_{11} and z_{21} by open circuiting the output port,



$\because \quad I_2 = 0$

$\therefore$ The circuit can be redrawn as



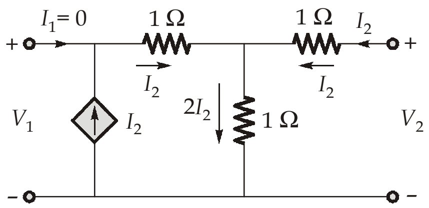
$$V_1 = 2I_1$$

and $$V_2 = I_1$$

$\therefore$ $$z_{11} = \frac{V_1}{I_1} = 2\,\Omega$$

and $$z_{21} = \frac{V_2}{I_1} = 1\,\Omega$$

Similarly z_{22} and z_{12} can be obtained by open circuiting the input port as,



$$V_1 = I_2 + 2I_2 = 3I_2$$

and $$V_2 = I_2 + 2I_2 = 3I_2$$

$\therefore$ $$z_{22} = \frac{V_2}{I_2} = 3\,\Omega$$

and $$z_{12} = \frac{V_1}{I_2} = 3\,\Omega$$

$\therefore$ z-parameter matrix $= \begin{bmatrix} 2\,\Omega & 3\,\Omega \\ 1\,\Omega & 3\,\Omega \end{bmatrix}$

30. (b)

For an RLC circuit,

$$f_0 = \frac{1}{2\pi}\sqrt{\frac{1}{LC}} \qquad \text{...(i)}$$

and $$f_2 - f_1 = \text{Bandwidth (BW)} = \frac{1}{2\pi}\times\frac{R}{L} \qquad \text{...(ii)}$$

from equation (i) and (ii)

$$\frac{BW}{f_0^2} = \frac{\frac{1}{2\pi}\times\frac{R}{L}}{\frac{1}{4\pi^2}\times\frac{1}{LC}} = 2\pi RC$$

or $$C = \frac{BW}{2\pi\times R\times f_0^2} = \frac{7.2\times 10^3}{2\times\pi\times 4.5\times 8\times 10^6\times 8\times 10^6} = 3.978 \text{ pF}$$

■■■■