Version: 203 **ID:** ____________ **Name:** ______________________ **Seat/Section:**

Question 1:

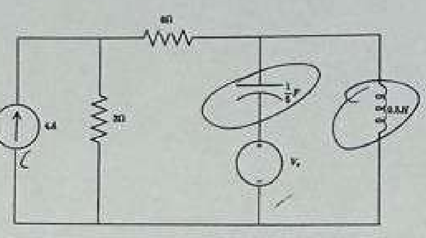


Figure: Q1

For the circuit shown in Fig. Q1, the correct first step for DC steady-state analysis is:
A: replace both by open circuits *B*: replace both by short circuits *C*: replace the capacitor by an open circuit and the inductor by a short circuit *D*: None of them *E*: replace the capacitor by a short circuit and the inductor by an open circuit

Question 2:

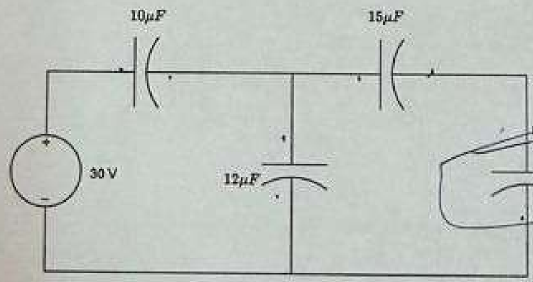


Figure: Q2

For the circuit shown in Fig. Q2, let $V_s = 30\,\text{V}$. The charge on the $22\,\mu\text{F}$ capacitor is:
A: $66\,\mu\text{C}$ *B*: $203\,\mu\text{C}$ *C*: None of them *D*: $9.7\,\mu\text{C}$ *E*: $86.5\,\mu\text{C}$

Question 3: Fig. Q3shows a parallel RLC circuit.
The admittance seen by the source is:

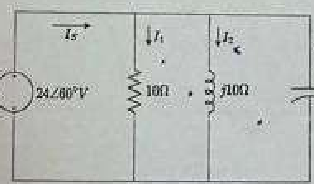


Figure: Q3

A: None of them *B*: $Y = 0.1 + j0.05$ S *C*: $Y = 0.1 - j0.05$ S *D*: $Y = 0.112\angle 26.6°$ S *E*: $Y = 0.05 - j0.1$ S

Question 4: For the circuit shown, the voltage across the capacitor V_C is expressed as:

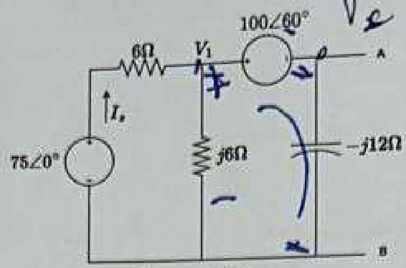


Figure: Q4

A: $V_C = 100\angle 60° - V_1$ B: None of them   C: $V_C = V_1 - 100\angle 60°$ D: $V_C = V_1 + 100\angle 60°$ E: $V_C = V_1$

Question 5: A sinusoidal source is given by

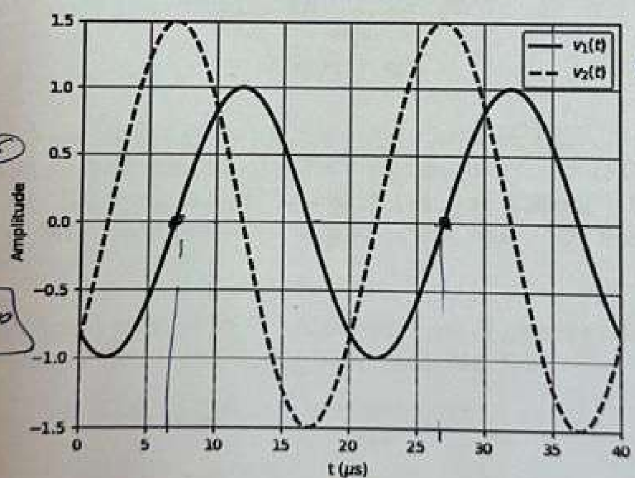
$$v_s(t) = 10\sin(1000t)\ \text{V}.$$

It is applied to a series $R-L-C$ circuit such that

$$R = X_C, \quad X_L = 2X_C$$

Which of the following statements is correct regarding the voltage across the inductor V_L?
A: V_L leads the source voltage by 45°.   B: V_L lags the source voltage by 45°.   C: None of these.
D: V_L lags the current by 90°.   E: V_L is in phase with the current.

Question 6:



The frequency of the signals is: A: 5 kHz   B: 20 kHz   C: 50 kHz   D: None of them   E: 100 kHz

Question 7: The voltage waveform across a 1 mF capacitor is shown in Fig. Q7.

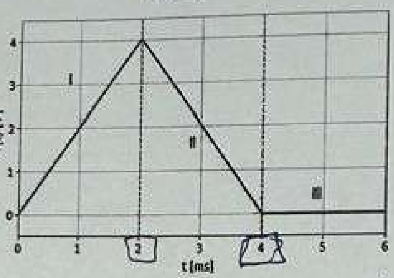


Figure: Q7

The capacitor current $i_C(t)$ during the interval

$$2 \le t \le 4 \text{ ms}$$

is:

A: 0 A. *B*: −2 A. *C*: +2 A. *D*: None of these. *E*: −4 A.

Question 8: The figure shows the voltage waveform applied to a load.

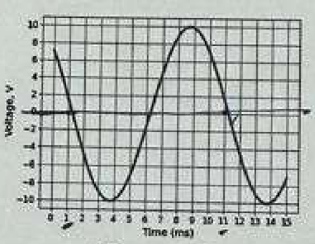


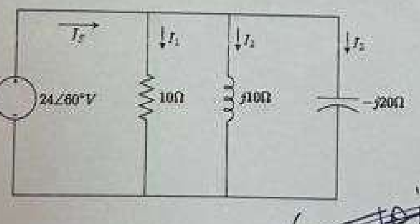
Figure 3: Q8

The current through the load is given by: $i(t) = 2\cos(\omega t + 75^\circ)$ A.

Determine the type of load and its equivalent parameters. *A*: R-C load, with $R = 4.33\,\Omega$ and $C = 636.6\,\mu$F *B*: R-L load, with $R = 4.33\,\Omega$ and $L = 3.98\,$mH *C*: Purely resistive load, with $R = 5\,\Omega$ *D*: Purely capacitive load, with $C = 318.3\,\mu$F *E*: Purely inductive load, with $L = 7.96\,$mH

Question 9: Fig. Q9shows a parallel RLC circuit and a set of phasors labeled A_1 to A_4.

Which phasor represents the current through the capacitor I_C?

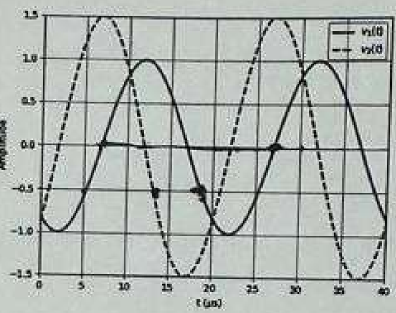


It is applied to a series $R-L-C$ circuit such that

$$R = X_C, \quad X_L = 2X_C.$$

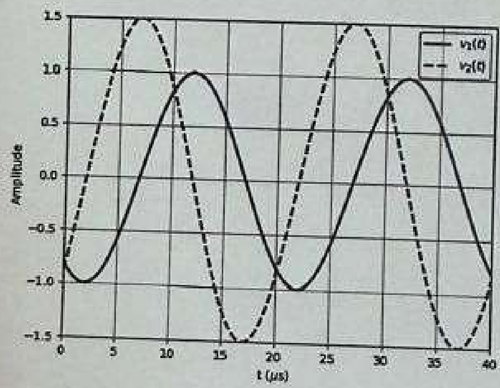
Find the phasor angle of the voltage across the inductor V_L.
A: None of these. B: $-135°$. C: $+45°$. D: $-90°$. E: $-45°$.

Question 17:



The time shift between the two signals is approximately: A: 15 μs B: 5 μs C: None of them D: 10 μs E: 2 μs

Question 18:



The phase difference defined as $\angle v_1(t) - \angle v_2(t)$ is:
A: 120° B: −90° C: 180° D: 90° E: None of them

Question 19: The sources in the circuit are:

$$v_1(t) = 6\cos(300t - 45°), \quad v_2(t) = 10\sin(120t + 30°)$$

Determine the current through the resistor.

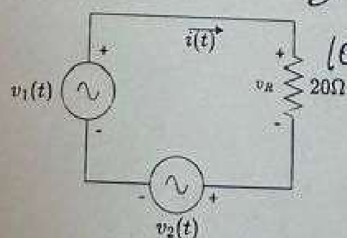


Figure: Q19

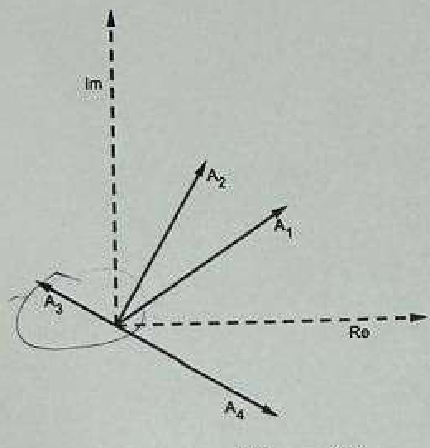


Figure: Q9

A: None of them *B*: A_3 *C*: A_2 *D*: A_1 *E*: A_4

Question 10: For the circuit shown, the phase relation between V_s and I_s is:

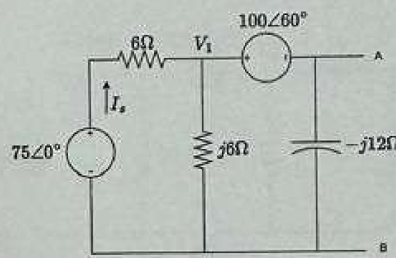
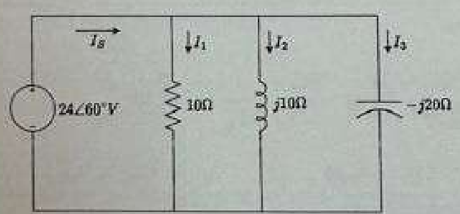


Figure: Q10

A: They are in phase *B*: I_s lags V_s by 60° *C*: I_s leads V_s by 28.7° *D*: I_s lags V_s by 28.7° *E*: None of them

Question 11: Fig. Q11shows a parallel RLC circuit and its phasor diagram.
Which phasor represents the total source current I_S?



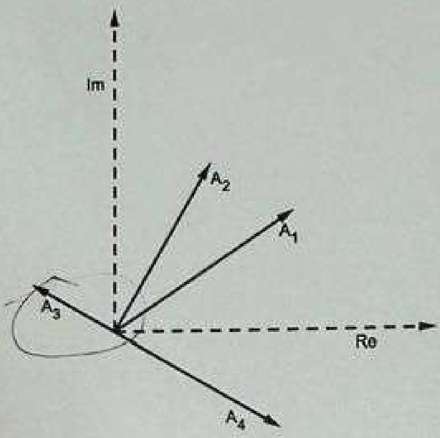


Figure: Q9

A: None of them B: A_3 C: A_2 D: A_1 E: A_4

Question 10: For the circuit shown, the phase relation between V_s and I_s is:

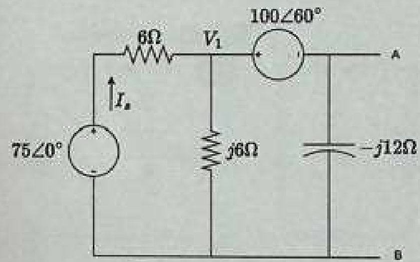
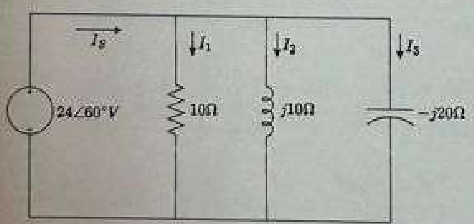


Figure: Q10

A: They are in phase B: I_s lags V_s by 60° C: I_s leads V_s by 28.7° D: I_s lags V_s by 28.7° E: None of them

Question 11: Fig. Q11shows a parallel RLC circuit and its phasor diagram.
Which phasor represents the total source current I_S?



$L = 2 \times 10^{-3}$ H

Figure: Q13

The inductor voltage $v_L(t)$ during the interval

$$2 \leq t \leq 4 \text{ ms}$$

is:

A: None of these. *B*: −4 V. *C*: +4 V. *D*: −8 V. *E*: 0 V.

Question 14: The circuit shown in Fig. Q14can be solved using one supermesh equation together with the current-source constraint equation. Which of the following equations correctly describes the supermesh in terms of i_x?

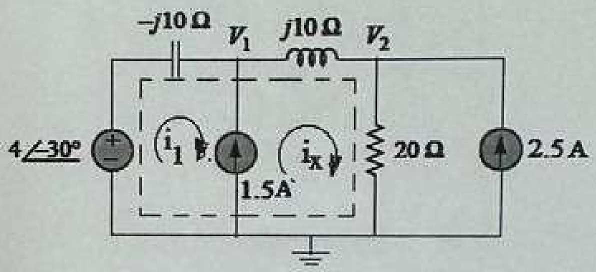


Figure: Q14

A:

$$-4\angle -30° + j10(i_x - 1.5) + j10i_x + 20(i_x + 2.5) = 0$$

B:

$$4\angle -30° - j10(i_x - 1.5) + j10i_x + 20(i_x + 2.5) = 0$$

C: None of these. *D*:

$$-4\angle -30° - j10(i_x - 1.5) + j10i_x + 20(i_x + 2.5) = 0$$

E:

$$-4\angle -30° - j10(i_x + 1.5) + j10i_x + 20(i_x - 2.5) = 0$$

Question 15:

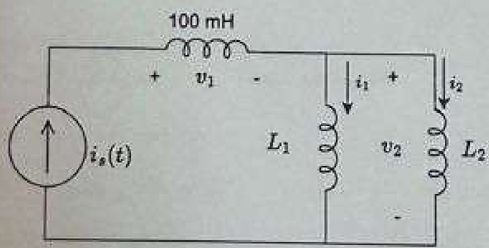


Figure: Q15

For the circuit shown in Fig. Q15, let $i_s(t) = 6(1 - e^{-5t})$ mA, with $i_2(0) = 0$, $L = 100$ mH, $L_1 = 20$ mH, and $L_2 = 40$ mH. The current $i_2(t)$ is:

A: $4(1 - e^{-5t})$ mA *B*: $2e^{-5t}$ mA *C*: $2(1 - e^{-5t})$ mA *D*: None of them *E*: $6(1 - e^{-5t})$ mA

Question 16: A sinusoidal source is given by

$$v_s(t) = 10\sin(1000t) \text{ V}.$$

−90°

A: $i(t) = 0.3\cos(300t - 45°) + 0.5\sin(120t + 30°)$ A *B*: $i(t) = 0.3\cos(300t - 45°) - 0.5\sin(120t + 30°)$ A *C*: $i(t) = 0.5\sin(120t + 30°) - 0.3\cos(300t - 45°)$ A *D*: $i(t) = 6\cos(300t - 45°) - 10\sin(120t + 30°)$ A *E*: None of them

Question 20: For the circuit shown, the source current I_s is:

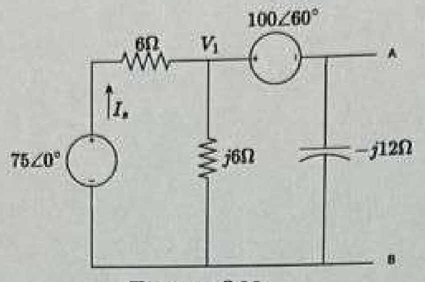


Figure: Q20

A: $11.33\angle -28.7°$ A *B*: $5.37\angle 26.6°$ A *C*: $6.02\angle -25.2°$ A *D*: $11.33\angle 28.7°$ A *E*: None of them

---

$$I_s = \frac{75\angle 0°}{13.4\angle 63.4}$$

$$Z_{total} = \frac{(-j12)(6j)}{-6j} + 6 = \frac{-72}{6j} + 6 = 13.4\angle 63$$

$$I_s = 5.59\angle -63.4°$$

$$I_s = \frac{100\angle 60°}{13.4\angle 63°} = 7.46\angle -3°$$

$$41.7\angle 190.2$$

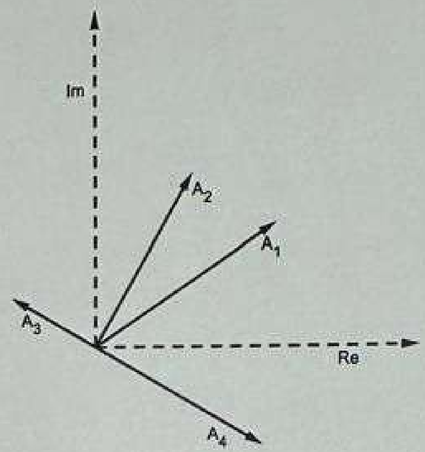


Figure: Q11

A: A_1 *B*: A_2 *C*: A_3 *D*: A_4 *E*: None of them

Question 12: For the circuit shown in Fig. Q12, which of the following equations correctly represents the supernode equation written in terms of V_1?

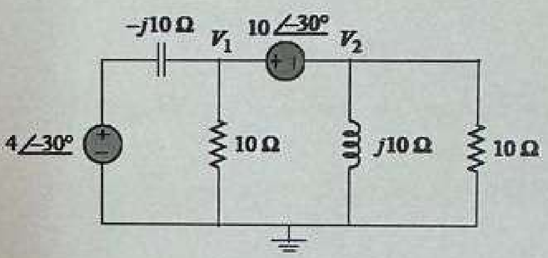


Figure: Q12

A:

$$\frac{V_1 - 4\angle-30^\circ}{-j10} + \frac{V_1}{10} + \frac{V_1 + 10\angle-30^\circ}{j10} + \frac{V_1 + 10\angle-30^\circ}{10} = 0$$

B: None of these. *C*:

$$\frac{V_1 - 4\angle-30^\circ}{-j10} + \frac{V_1}{10} + \frac{V_1 - 10\angle-30^\circ}{j10} + \frac{V_1 - 10\angle-30^\circ}{10} = 0$$

D:

$$\frac{V_1 - 4\angle-30^\circ}{j10} + \frac{V_1}{10} + \frac{V_1 + 10\angle-30^\circ}{j10} + \frac{V_1 + 10\angle-30^\circ}{10} = 0$$

E:

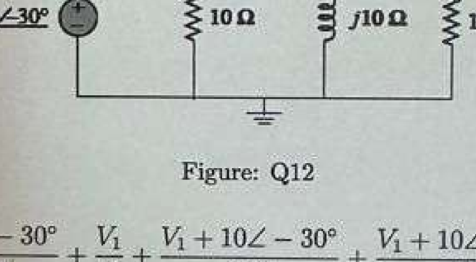
$$\frac{V_1 - 4\angle-30^\circ}{-j10} + \frac{V_1}{10} + \frac{V_1 - 10\angle-30^\circ}{10} = 0$$

$i(3) =$

Question 13: The current waveform through a 2 mH inductor is shown in Fig. Q13.

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

$V_L = 2\times10^{-3}(-2) =$



$i(t) = \frac{-4}{2}t$

$\frac{di}{dt} = -2$