Name :
Reg NO :
Section :
Paper :

ASHFAQ AHMA
19PWCSE 1795
B
CS-II

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(2) Ans Given:

$R = 10\ \Omega$

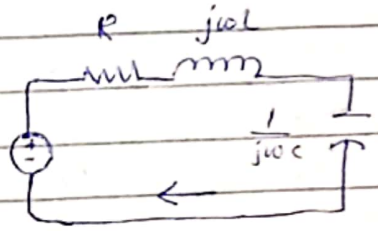
$L = 1\ mH$

$C = \frac{1+7+9+5}{4} \times 10\ mF$

$C = 55\ mF$

$V_s = 10\angle 0^\circ$

$\omega = 1000\ rad/s$



Sol

first we find Z_L & Z_C

$Z_L = j\omega L$ put values

$Z_L = j(1000)(1\times10^{-3})\ \Omega$

$Z_L = 1j\ \Omega$

Now

$Z_C = \frac{1}{j\omega C}$ put values

$= \frac{1}{j(1000)(55\times10^{-3})}$

$= -j\frac{1}{55}\ \Omega$

$Z_C = -j\,0.01818\ \Omega$

Now we find equivelent Impedence

P + T P O

$$Z_e = R + Z_c + Z_L$$

$$Z_e = 10 + 1j + (-j0.01818)$$

$$Z_e = 10 + 1j - j0.01818$$

$$Z_e = 10 + j0.982\ \Omega$$

Now current is given by,

$$I(\omega) = \frac{V_s(\omega)}{Z_e(\omega)}$$ put values

$$I(\omega) = \frac{10\angle 0^\circ}{(10 + j0.982)\Omega}$$

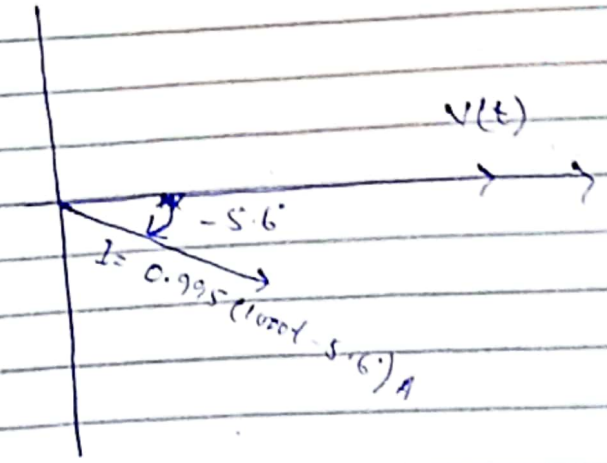
$$I(\omega) = \frac{10\angle 0^\circ}{10.048\angle 5.6^\circ}$$

$$\boxed{I(\omega) = 0.995\angle -5.6^\circ}$$

(or)

$$\boxed{I(t) = 0.995 \cos(10\omega t - 5.6^\circ)\ A}$$ Ans

Phasor plot.



Q4:

Given

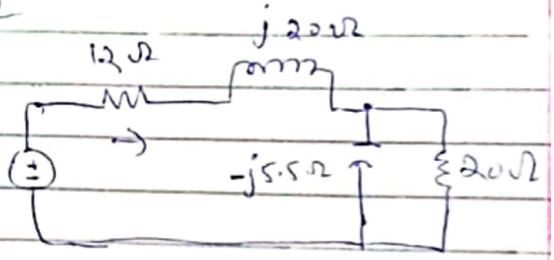
$I = ?$

$V_s = 50 \angle 120^\circ V$ rms

Complex power $= S = ??$

$X_c = \left(\frac{1+7+9+5}{4}\right) \Omega$

$X_c = 5.5 \Omega$



Sol

Consider Source voltage

$V = 50 \angle 120^\circ V$ rms

Calculate maximum Amplitude of

$V_m = \sqrt{2}\, V$ rms

$V_m = 50\sqrt{2}\, V_{rms}$

Calculate equivalent Z_{eq}

$$Z_{eq} = (12 + j20) + \frac{(20)(-j5.5)}{20 - j5.5}$$

$$Z_{eq} = (12 + j20) + \frac{110 \angle -90}{22.36 \angle -21.56}$$

$$Z_{eq} = (12 + j20) + (4 - j8)$$

$$Z_{eq} = 16 + j12$$

Now calculate $I_{max} = ??$

P f T f o

$I_m = \frac{V_m}{Z_{eq}}$ Put values

$I_m = \frac{50\sqrt{2} \angle 120^\circ}{16 + j12}$

After Solving we get

$I_m = 3.535 \angle 83.13^\circ A$

Now Calculate RMS Value of the current

$I_m = \frac{I_m}{\sqrt{2}} = \frac{3.535 \angle 83.13^\circ}{\sqrt{2}}$

$I_m = 2.5 \angle 83.13^\circ A$

* Therefore, rms Value of Current is $2.5 \angle 83.13^\circ A$.

* And Maximum value of current is $3.535 \angle 83.13^\circ A$.

Now we find Complex power delivered by Source As

$S = VI^*$

$S = \frac{V_m I_m}{2} \angle \theta_V - \theta_I$

Now put values of V_m, I_m we get

$$S = \frac{(50\sqrt{2})(3.535)}{2} \angle (120^\circ - 83.13^\circ)^*$$

$$= 125 \angle 36.87^\circ \text{ VA}$$

$$= 125 \cos 36.87^\circ + j\, 125 \sin 36.87^\circ$$

$$S = 100 + j\,75 \text{ VA}$$

So

$$\boxed{S = 100 + j\,75 \text{ VA}}$$ Ans

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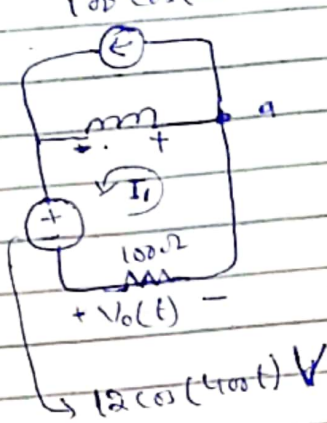
Ans Given:

$V_o(t) = ?$

$\omega = (1+7+9+5) \times 10$ rad/s

$\omega = 220$ rad/s



Sol

first we find X_L

$X_L = j\omega L$

$X_L = j(220)(0.375)\ \Omega$

$X_L = j82.5\ \Omega$

Now Apply KVL to lower mesh

$-I_1(82.5) - 12\angle 0^\circ - V_o(t) = 0$

$V_o(t) = -I_1(j82.5) - 12\angle 0^\circ$ — (1)

Now we find I_1

Apply KCL at node (a).

$I_1 = \frac{12\angle 0^\circ}{j82.5\Omega} + 100\angle 0^\circ$

$$\underline{I_1} = \frac{12\angle 0}{82.5\angle 90} + 100\angle 0$$

$$I_1 = 0.145\angle -90 + 100\angle 0$$

$$I_1 = (0 - j0.014) + (100 + 0j)$$

$$I_1 = (100 - j0.014)\,A$$

put in eq (1)

$$V_o(t) = -(100 - j0.14)(j82.5) - 12\angle 0$$

$$V_o(t) = -(100\angle 0.08)(82.5\angle 90) - 12\angle 0$$

$$V_o(t) = -(8250\angle 90.08) - 12\angle 0$$

$$V_o(t) = -(-11.51 + j8249.9) - (12 + 0j)$$

$$V_o(t) = 11.51 - j8250 - 12$$

$$V_o(t) = -0.49 - j8250$$

$$V_o(t) = 8250\angle -90^\circ$$

(a) $V_o(t) = 8250\cos(220t - 90^\circ)$ Ans

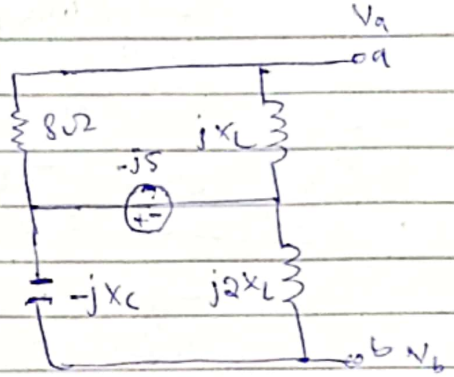
Given

$V_t = ?$ $\quad V_t = ?$

$Z_t = ?$ $\quad Z_t = ?$

$X_L = 1+7+9+5 = 22\ \Omega$

$X_c = 5.5\ \Omega$



Sol

$$V_t = V_a + V_b \quad \text{---} \quad (1)$$

$$V_a = \frac{-j5}{8+jX_L} \times jX_L$$

$$V_a = \frac{-j5}{8+j22} \times j22$$

$$V_a = \frac{-j^2\,110}{8+j22}$$

$$V_a = \frac{110}{23.40\angle 70^\circ}$$

$$V_a = \frac{110\angle 0^\circ}{23.40\angle 70^\circ}$$

$$\boxed{V_a = 4.70\angle -70^\circ}$$

$$V_b = \frac{-j5}{j44 - j8.5} \times j44$$

$$V_b = \frac{-j5}{j39.5} \times j44$$

$$V_b = \frac{220\angle 0^\circ}{39.5\angle 90}$$

$$V_b = 5.56\angle -90^\circ$$

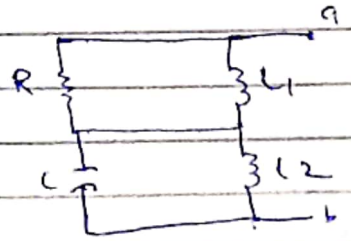
Now

$$V_t = V_a + V_b$$

$$V_t = 4.70\angle -70 + 5.56\angle -90$$

Now $Z_t = ??$

for Z_t circuit becomes

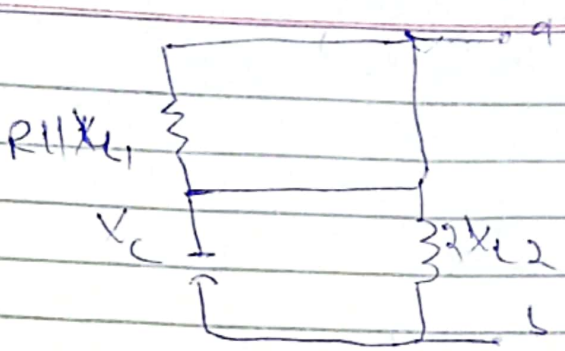


$$R \| L_1 = \frac{1}{\frac{1}{R} + \frac{1}{X_{L_1}}}$$

$$= \frac{R X_{L_1}}{R X_{L_1}}$$

$$= \frac{8 + 22j}{8(23j)}$$

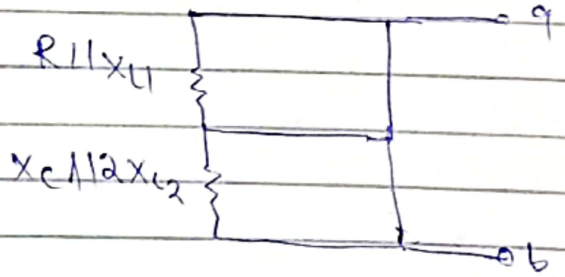
$$R \| L_1 = \frac{8 + 22j}{176j}$$



Now $X_C || 2X_{L2}$ So

$$X_C || X_{L2} = \frac{X_C + 2X_{L2}}{(X_C)(2X_{L2})}$$

$$= \frac{-j5.5 + j44}{(-j5.5)(j44)}$$



$$\frac{1}{Z_e} = \frac{1}{R||X_{L1}} + \frac{1}{X_C||2X_{L2}}$$

Any

the END