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REG.NO 19PWCSE1801

SECTION A

Question No 1

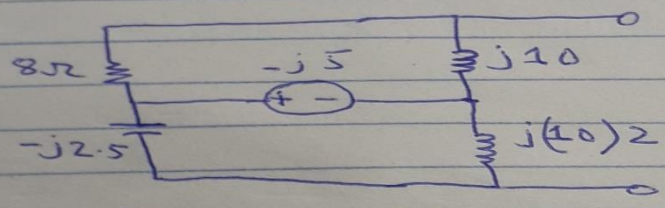
Reg. No = 1801

$X_L = 1 + 8 + 0 + 1$

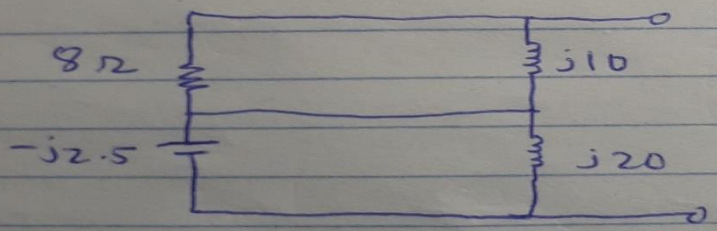
$X_L = 10\ \Omega$

$X_C = \frac{1+8+0+1}{4} = \frac{10}{4}$

$X_C = 2.5\ \Omega$



To find Thevine equivlent, let Short the Voltage Source The circuit become



8Ω and j10 are in parallel

$Z_{(8)(j10)} = \frac{(8)(j10)}{8+j10}$

2)

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$$= \frac{80j}{8+j10} \Rightarrow \frac{80\angle 90^\circ}{12.8\angle 51}$$

$$\boxed{Z_{12} = 6.25\angle 39^\circ}$$

And $-j2.5$ and $j20$ are is parellel

$$Z_{34} = \frac{(-j2.5)(j20)}{j20 + (-j2.5)}$$

$$Z_{34} = \frac{50\angle 0^\circ}{17.5\angle 90^\circ}$$

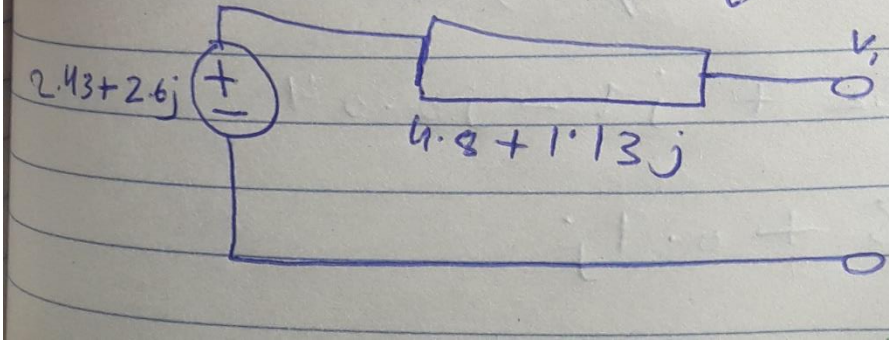
$$\boxed{Z_{34} = 2.8\angle -90^\circ}$$

$$Z_T = (6.25\angle 39^\circ) + (2.8\angle -90^\circ)$$

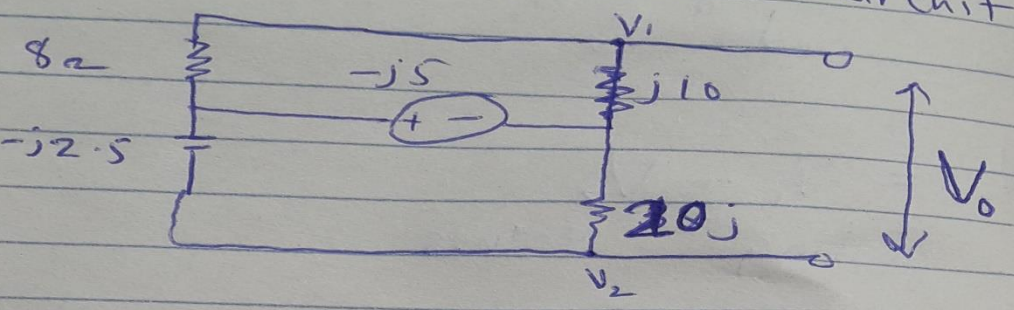
$$Z_T = 4.8 + 3.9j + 0 - 2.8j$$

$$Z_{Total} = 4.8 + 1.13j$$

The Thevinen equivent Circuit



To Voltage drop across open terminal of the circuit



Let first find V_1, $\&$ V_2
By Voltage division formula

$$V_1 = \frac{j10}{8+10j}(-j5)$$

$$V_1 = \frac{50\angle 0^\circ}{12\angle 51.3}$$

$$V_1 = 3.9\angle -51.3^\circ$$

$$V_2 = \frac{j20}{j20 - j2.5} \times -j5$$

$$V_2 = \frac{20\angle 90^\circ}{17.5\angle 90^\circ} \times 5\angle -90^\circ$$

$$V_2 = \frac{100\angle 0^\circ}{17.5\angle 90^\circ}$$

$$V_2 = 5.71\angle -90^\circ$$

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Where V_1 and V_2 are the drop across j10 and j20 respectively.

Now, find "V_o"

$$V_o = V_1 - V_2$$

putting values

$$V_o = (3.9 \angle 51.3^\circ) - (5.7 \angle 90^\circ)$$

$$\boxed{V_o = 3.60 \angle 47.4^\circ}$$

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Question No 2

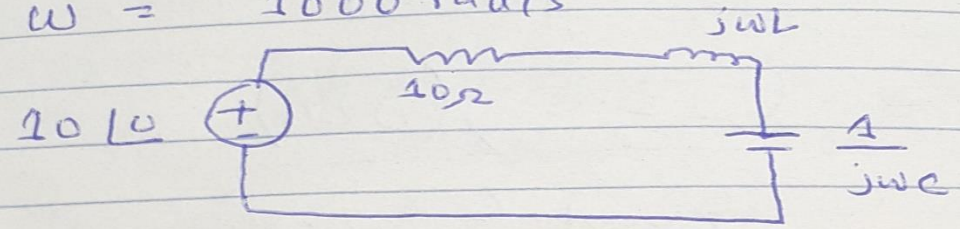
$R = 10\,\Omega$, $L = 1\,mH$

$C = \frac{1+8+0+1}{4} \times 10\,mF$

$C = 2.5 \times 10\,mF$

$C = 25\,mF$

$\omega = 1000\ rad/s$

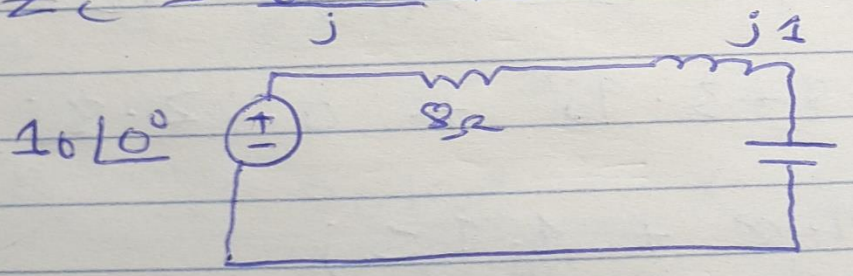


$Z_L = jwL = j(1000)(1 \times 10^{-3})$

$Z_L = j1\ \Omega$

$Z_c = \frac{1}{jwc} = \frac{1}{j(1000)(25mF)}$

$Z_c = \frac{0.04}{j}\ \Omega$



Now find Z_{eq}, of series

$Z_{eq} = 8\Omega + j1 - j0.04$

$Z_{eq} = 8 + 0.9j$

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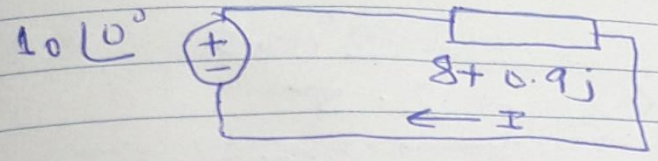
The circuit become



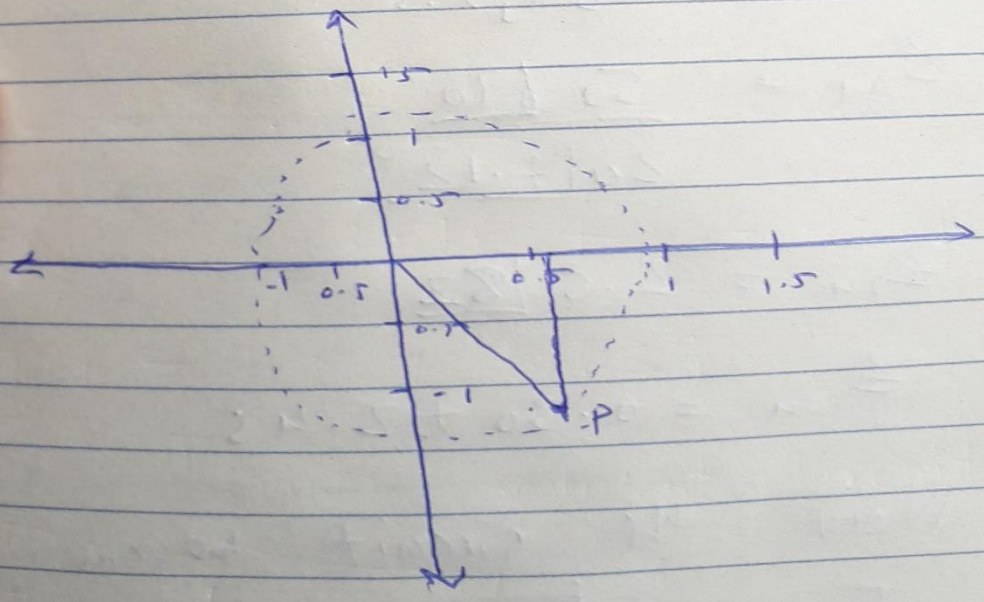
Now find current, I

$$I = \frac{10\angle 0^\circ}{8+0.9j}$$

$$I = \frac{10\angle 0^\circ}{8\angle 6.4^\circ}$$

$$\boxed{I = 1.25\angle -6.4^\circ}$$

plot :-



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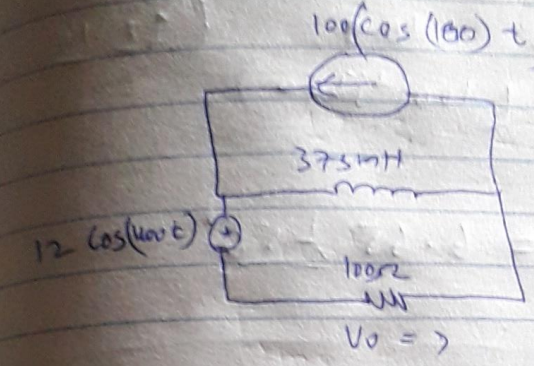
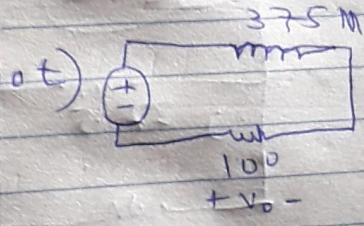
Question No 3



$w = (1 + 8 + 01) \times 10$

$w = 10 \times 10 = 100 \text{ rad/s}$

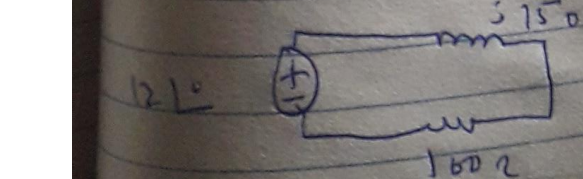
Let leave the current sorce open, then circuit become



$Z_L = j(400)(3.75 \times 10^{-3})$

~~$Z_L = j87.5$~~ $Z_L = j150$

$Z_R = 100\,\Omega$



To find V_R

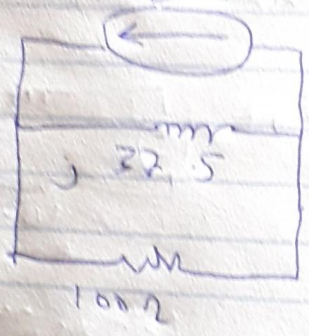
$$V_R = \frac{100}{(100 + j25)} (12\angle 0^\circ)$$

$$V_R = 6.65\angle 56^\circ$$

$$\boxed{V_o(t) = 6.65\cos(400t + 56.3^\circ)V}$$

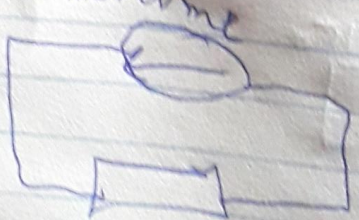
Now find $V_o(t)$

$0.1\angle 0^\circ$



$$Z = \frac{(37.5)(100)}{(37.5)(+100)} = \boxed{27.2\angle 58^\circ}$$

The circuit becomes

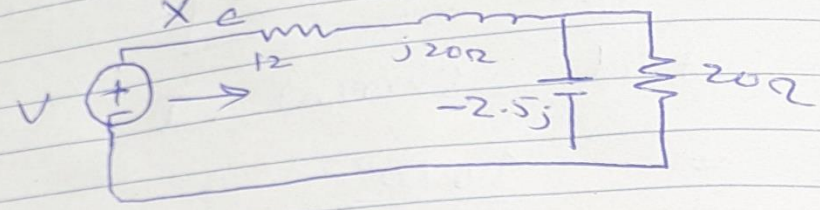


$27.2\angle 0^\circ$

Question No 4

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

$X_c = 2.5$



12 and j20 are is series, so

$Z_{12} = 12 + j20$

And, $-2.5j$ and 20Ω are in parallel

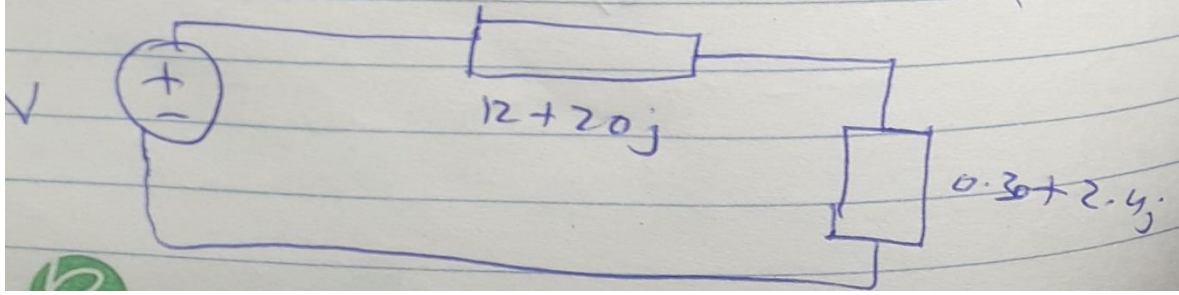
$$Z_{34} = \frac{(20)(2.5j)}{20 + j2.5}$$

$$Z_{34} = \frac{50\angle 90^\circ}{20\angle 7.12^\circ}$$

$$Z_{34} = 2.5\angle 82^\circ$$

$$Z_{34} = 0.30 + 2.4j$$

Now the circuit becomes



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The Two impedence are in series

$$Z_{Total} = (12+20j)+(0.30+2.4j)$$

$$\boxed{Z_T = 12.3 + 22.4j}$$

The current is

$$I_{rms} = \frac{V}{Z_T}$$

$$I_{rms} = \frac{50\angle 120^\circ}{12.3+22.4j}$$

$$I_{rms} = \frac{50\angle 120^\circ}{25.5\angle 61.2}$$

$$\boxed{I_{rms} = 1.9\angle 58.8^\circ}$$

And Complex Power is "S"

$$S = V_{rms}\, I_{rms}$$

$$= (50\angle 120^\circ)(1.9\angle 58.8^\circ)$$

$$\boxed{S = 95\angle 178.8^\circ}$$