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Ans no. 1

Here,

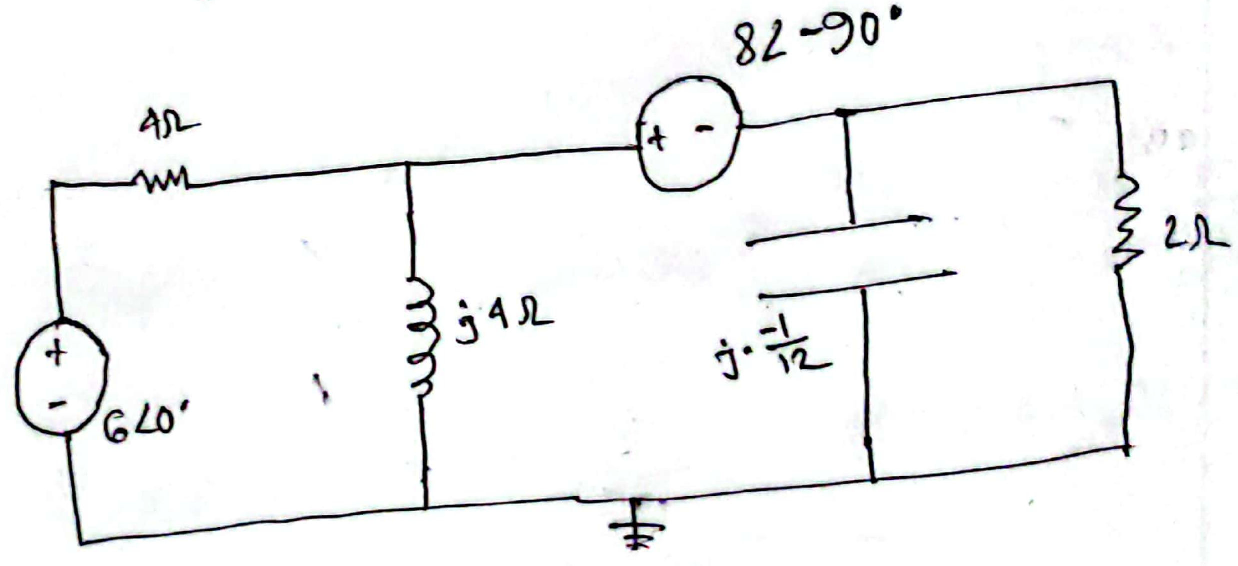
$6\cos(2t)\,V = 6\angle 0^\circ$

$8\sin(2t)\,V = 8\angle -90^\circ$

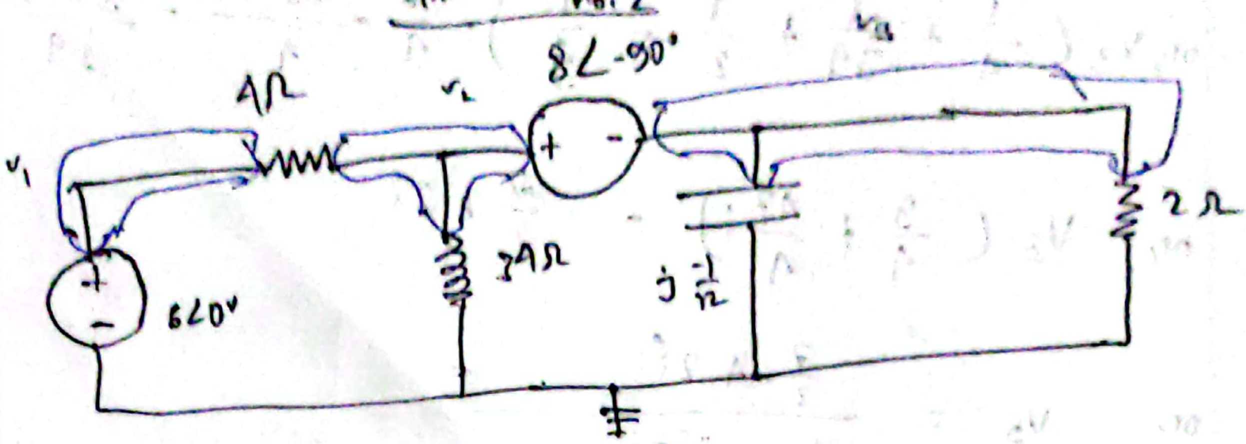
$2H = j.\omega.L = j \times 2 \times 2$

$= j4$

$6F = \frac{1}{j.\omega.C} = \frac{1}{j.2.6} = j.\frac{-1}{12}$



Ans no. 2



Now,

$V_1 = 6\angle 0° = 6V$

$\boxed{V_2 - V_3 = 8\angle -90°}$ $\Rightarrow V_2 = V_3 + 8\angle -90°$ —(I)

Supernode;

$V_2\left(\frac{1}{4} + \frac{1}{j4}\right) - \frac{V_1}{4} + V_3\left(\frac{1}{j\frac{-1}{12}} + \frac{1}{2}\right) = 0$

or, $\boxed{V_2\left(\frac{1}{4} + \frac{1}{j4}\right) + V_3\left(\frac{1}{2} - \frac{12}{j}\right) = \frac{6}{4}}$ —(II)

Ans no. 3

or,

putting (I) in (II),

$(V_3 + 8\angle -90)\left(\frac{1}{4} + \frac{1}{j4}\right) + V_3\left(\frac{1}{2} - \frac{12}{j}\right) = \frac{6}{4}$

or, $V_3 \cdot \frac{1}{4} + \frac{V_3}{j4} + \frac{8\angle -90}{4} + \frac{8\angle -90}{j4} + V_3\left(\frac{1}{2} - \frac{12}{j}\right) = \frac{6}{4}$

or, $V_3\left(\frac{1}{4}+\frac{1}{j4}+\frac{1}{2}-\frac{12}{j}\right)=\frac{6}{4}-\frac{8\angle-90}{4}-\frac{8\angle-90}{j4}$

or $V_3\left(\frac{3}{4}+\frac{47}{4}i\right)=\frac{7}{2}+2i$

or $V_3=\dfrac{\frac{7}{2}+2i}{\frac{3}{4}+\frac{47}{4}i}$

$=0.3424\angle-56.6029°$

Now

$V_2=V_3+8\angle-90$

$=8.28798\angle-88.69705$ (Ans)

$\therefore V_1=6V$

$V_2=8.287\angle-88.697V$

$V_3=0.3424\angle-56.6029V$ (Ans)

Ans no. 4

Here,

$\cancel{V_2}$

$V_2 - 0 = i_x \times Z$

or, $i_x = \dfrac{8.287 \angle -88.697}{j4}$

$= 2.07175 \angle -178.697$

$\therefore i(t) = 2.07175 \cos(2t - 178.697)$

(Ans)