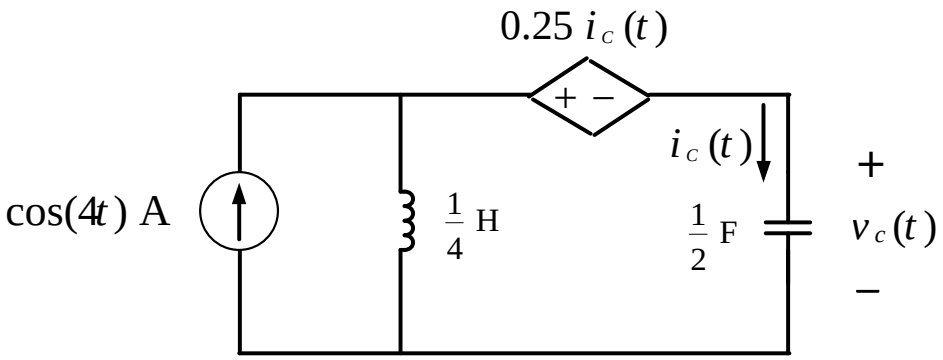
EE 202-01 – Fall 2012(122)

Quiz 6

SER	ID	NAME **KEY**



For the circuit shown above , find $v_C(t)$?

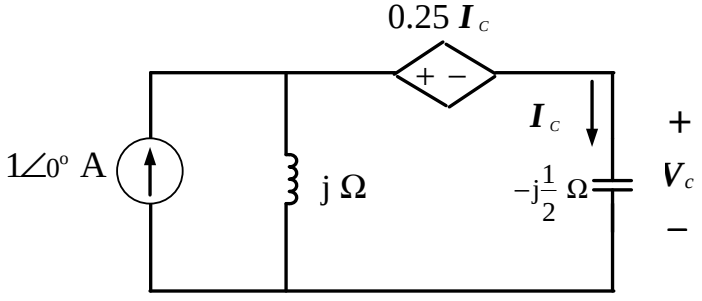
Solution

Transform the circuit to the phasor domain

$\cos(4t)\text{ A} \Rightarrow 1\angle 0^o\text{ A}$

$Z_L = \text{j}\,\omega L = \text{j}\,(4)\left(\frac{1}{4}\right) = \text{j}\,\Omega$

$Z_C = \frac{1}{\text{j}\,\omega C} = \frac{1}{\text{j}\,(4)\left(\frac{1}{2}\right)} = -\text{j}\,\frac{1}{2}\Omega$



Source Transformation

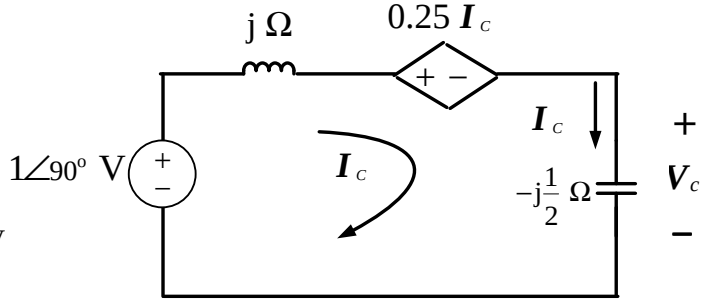
KVL

$-1\angle 90^o + \text{J}\boldsymbol{I}_c + 0.25\boldsymbol{I}_c - \text{J}\frac{1}{2}\boldsymbol{I}_c = 0$

$\Rightarrow \boldsymbol{I}_c = \frac{1\angle 90^o}{\left(0.25 + \text{J}\frac{1}{2}\right)} = \frac{8}{5} + \text{J}\frac{4}{5} = 1.78\angle 26.56^o\text{ A}$

$\Rightarrow \boldsymbol{V}_c = -\text{J}\frac{1}{2}\boldsymbol{I}_c = \left(1\angle -90^o\right)\left(\frac{1}{2}\right)\left(1.78\angle 26.56^o\right) = 0.89\angle -63.44^o\text{ V}$

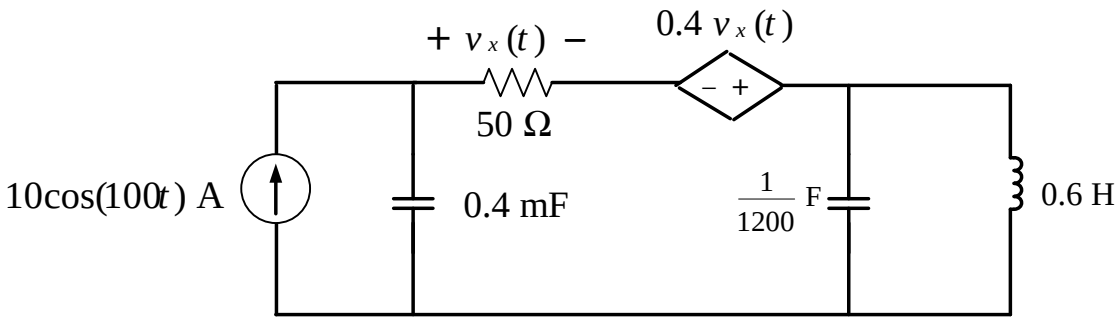
$\Rightarrow v_c(t) = 0.89\cos(4t - 63.44^o)\text{ V}$



EE 202-02 – Fall 2012(122)

Quiz 6

SER	ID	NAME **KEY**



For the circuit shown above , find $v_x(t)$?

Solution

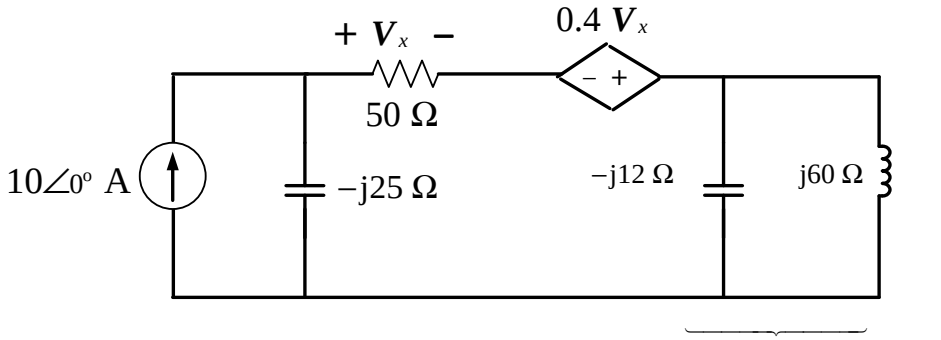
Transform the circuit to the phasor domain

$10\cos(100t)\text{ A} \Rightarrow 10\angle 0^o\text{ A}$

$$Z_{C_1} = \frac{1}{j\,\omega C_1} = \frac{1}{j\,(100)\left(0.4X10^{-3}\right)} = -j\,25\Omega$$

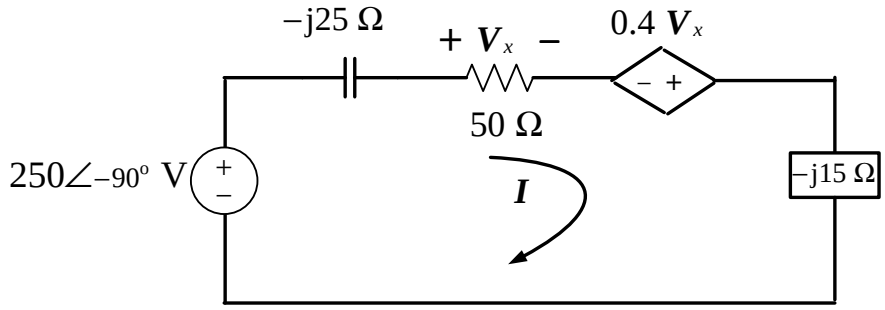
$$Z_{C_2} = \frac{1}{j\,\omega C_2} = \frac{1}{j\,(100)\left(\frac{1}{1200}\right)} = -j\,12\ \Omega$$

$$Z_L = j\,\omega L = j\,(100)(0.6) = j60\ \Omega$$



$$Z_{EQ} = \left(-j12 \| j60\right) = -j15\ \Omega$$

Source Transformation



KVL

$$-250\angle -90^o + (-j25+50)\boldsymbol{I}_c + 0.4\boldsymbol{V}_x - j15\boldsymbol{I} = 0$$

$$\boldsymbol{V}_x = (50)\boldsymbol{I} \Rightarrow \boldsymbol{I} = \frac{250\angle -90^o}{(30-J40)} = 5\angle -36.87^o\text{ A}$$

$$\Rightarrow \boldsymbol{V}_x = (50)\boldsymbol{I} = (50)\left(5\angle -36.87^o\right) = 250\angle -36.87^o\text{ V}$$

$$\Rightarrow v_x(t) = 250\cos(100t - 36.87^o)\text{ V}$$