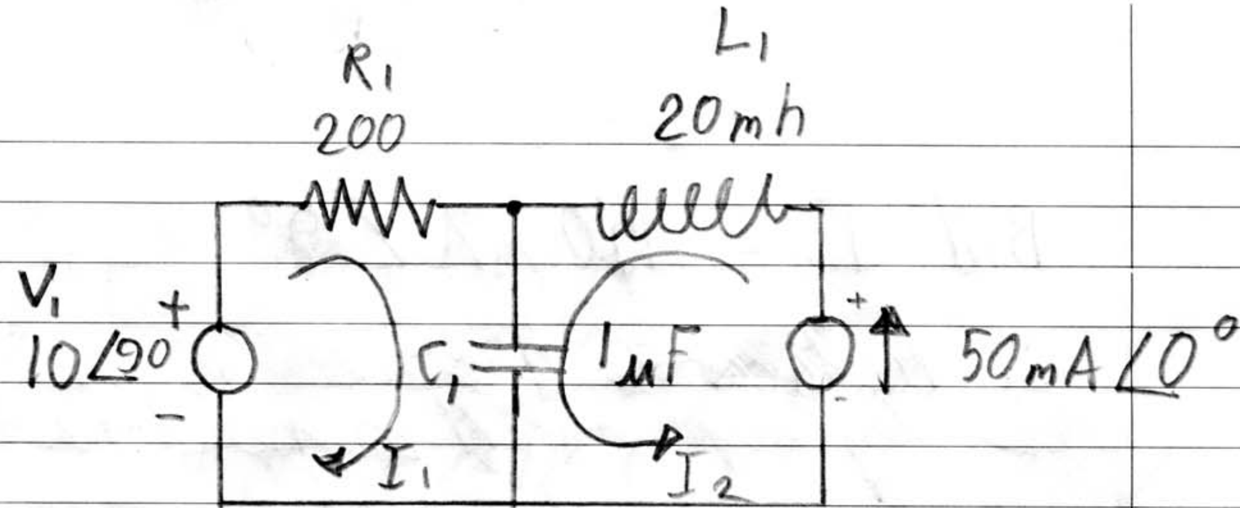


$F = 1592\ hz$

Solve using mesh analysis

$\omega = 2\pi\, 1592 = 10^4\ rad/s$

$\therefore\ Z_{L_1} = j\omega L = j10^4(20\times10^{-3}) = j200\ \Omega$

$= 200\angle 90$

$Z_{C_1} = -j\frac{1}{\omega C} = \frac{-j}{10^4\, 10^{-6}} = -j100\ \Omega$

$= 100\angle -90$

Mesh equation

$$V_1 = \left(R_1 - \frac{j}{\omega C}\right)I_1 + \left(\frac{-j}{\omega C}\right)I_2$$

$$10\angle 90^\circ = (200 - j100)I_1 - j100\,I_2$$

But $I_2 = 50\,mA \angle 0°$

$\therefore$ reduces to 1 equation
by supermesh or pseudomesh

$$j10 = (200 - j100) I_1 - j100(.05)$$

$$j10 + j5 = j15 = (200 - j100) I_1$$

$$I_{R_1} = I_1 = \frac{j15}{(200 - j100)} \qquad \cancel{\theta} - \arctan\left(\frac{-100}{200}\right)$$

$$= -26.6°$$

$$= \frac{15 \angle 90°}{223.6 \angle -26.6°}$$

$$= 67.1\,mA \angle 116.6°$$

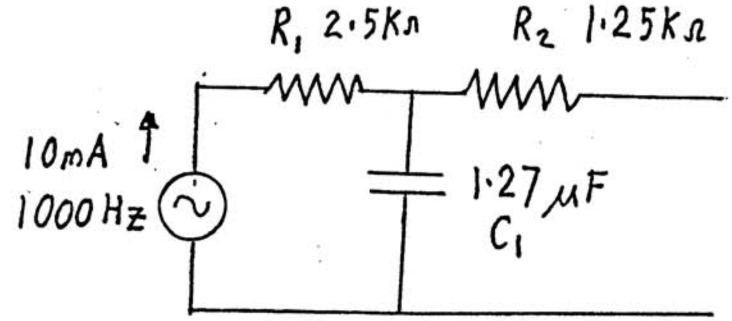
$$I_{C_1} = I_1 + I_2 = (-30 + j60) + (50)\,mA$$

$$= (20 + j60)\,mA$$

$$= 63.2\,mA \angle 71.6°$$

$$V_{C_1} = Z_{C_1} I_{C_1}$$
$$= 100\angle{-90^\circ}\; 63.2\,mA\angle{71.6^\circ}$$
$$= 6.32\angle{-18.4^\circ} = (6 - j2)\ V$$
$$V_{R_1} = R_1 I_1$$
$$= 200\,(67.1\angle{116.6^\circ})$$
$$= 13.4\angle{116.6^\circ} = (-6 + j12)\ V$$

$$V_1 = V_{R1} + V_{C_1} = (-6 + j12) + (6 - j2)$$
$$= j10\ V$$



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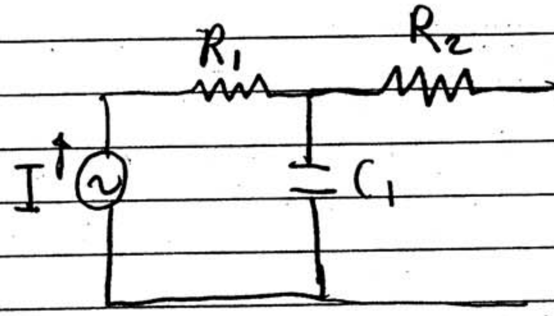

For thevenin want the open circuit voltage

$V_{th} = I Z_C$

Since power is a current source

$V_{th} = I_1 Z_C = I_1 \frac{1}{j\omega C_1}$

$\omega = 2\pi 1000 = 6283$ rad/S

$\therefore I_1 = 10mA\angle 0^\circ$

$Z_C = \frac{1}{j\omega C} = \frac{1}{j6283} = \frac{1}{j7.98\times10^{-3}} = -j125$

$= -125\angle -90^\circ$

$V_{th} = I Z_C = 10m\angle 0 \; 125\angle -90$

$= 1.25 \angle -90 \text{ V}$

Input impedance for Z_{th}

Open circuiting the I

$Z_{th} = R_2 + Z_{C_1} = 1250 - j125$

$|Z_{th}| = \sqrt{1250^2 + 125^2} = 1256$

$\theta_{th} = \tan^{-1}\left(\frac{Z_I}{Z_R}\right) = \tan^{-1}\left(\frac{-125}{1250}\right) = -5.72^\circ$

$Z_{Th} = 1256 \angle -5.72^\circ$

(b) Norton equivalent

$Z_N = Z_{th} = 1256 \angle -5.72$

$I_N = \frac{V_{th}}{Z_{th}} = \frac{1.25\angle -90^\circ}{1256 \angle -5.72}$

$= 1.0 \text{ mA} \angle -84.3^\circ$