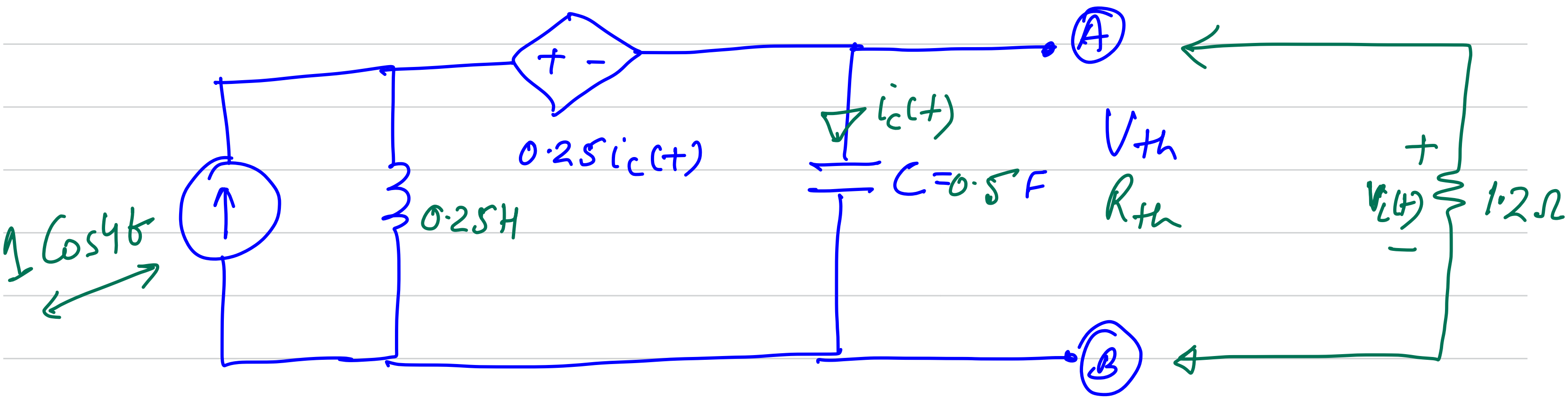
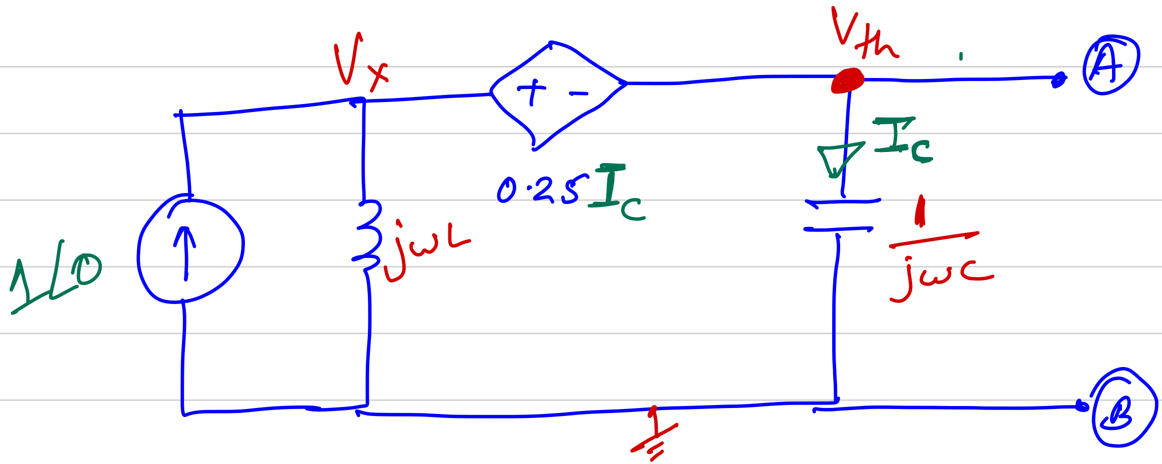
Q Find the equivalent of the circuit shown below if $\omega = 4$ rad/s

Determine $V_L(t)$ when $1.2\,\Omega$ resistor is connected across the terminal





$V_{AB} = V_{th}$

$$V_x\left\{\frac{1}{j\omega L}\right\} + V_{th}\left\{j\omega C\right\} = 1\angle 0$$

$$\left\{ -jV_x + 2jV_{th} = 1\angle 0 \right\}$$

$$V_x - 0.25\, I_c = V_{th}$$

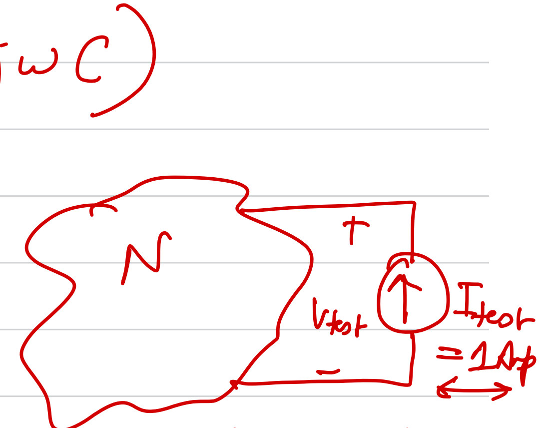
$$I_c = \left\{ \left(V_{th}\, j\omega C \right) \right\}$$

$$V_x - 0.25\, V_{th}\, j\omega C = V_{th}$$

$$\cancel{V_{th}} \quad V_x = V_{th}\left(1 + 0.25\, j\omega C\right)$$

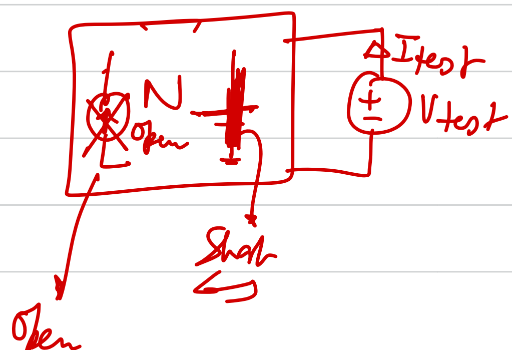
$$V_x = V_{th}\left(1 + j0.5\right)$$

$$V_{th} = 0.894 \angle -63.43^{\circ}$$

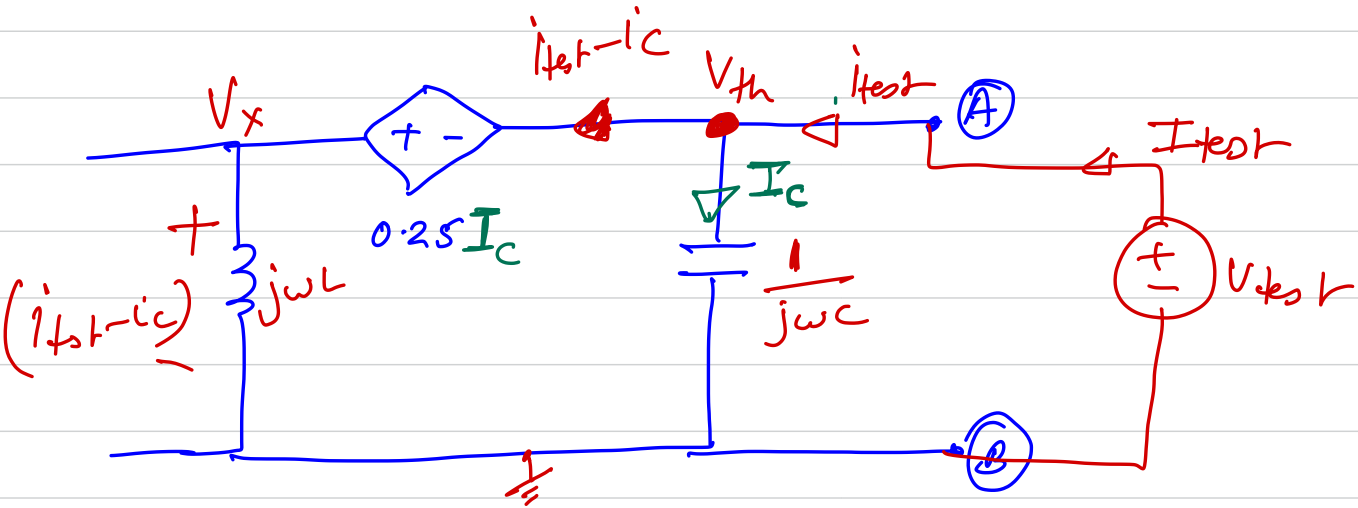


$$R_{test} = \frac{V_{test}}{1\, Amp}$$

$R_{eq} \Rightarrow$



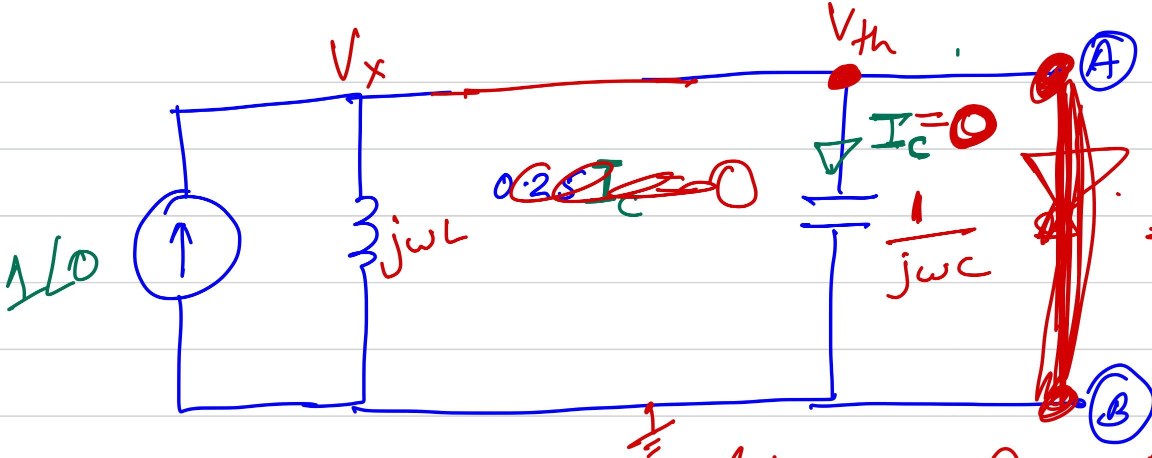
$$\Rightarrow R_{eq_i} = \frac{V_{test}}{I_{test}}$$



$$V_{test} = (jwL)(i_{test} - i_c) - 0.25 I_c$$

$$V_{test} = \frac{I_c}{jwC}$$

$$\frac{V_{test}}{I_{test}} = R_{th} = (0.4 - j0.8)$$



$i_{sc} = 1\angle 0$

$$\left(\frac{1}{\omega C} = 0.8\right)$$

$$R_{th} = \frac{V_{th}}{i_{sc}} = 0.4 - j0.8$$

$$\left(R + j\omega L + \frac{1}{j\omega C}\right)$$

$$\left(\frac{1}{\omega C} = 0.8\right)$$

$$R_{th} = \left\{ (0.4 - j0.8) \right\} \Longleftrightarrow R, C$$

$$R = 0.4\,\Omega \qquad C = 0.3125\,F$$

$$\left(R + \frac{1}{j\omega C}\right)$$

$$\left(R - \frac{j}{\omega C}\right)$$

$V_{th} =$

$R + j\omega L - \frac{j}{\omega C} \Rightarrow R - j\left(-\omega L + \frac{1}{\omega C}\right)$

$\left\{ \left(\omega^2 \gg \left(\frac{1}{LC}\right)\right) \right\}$

$\left(\omega L \gg \frac{1}{\omega C}\right)$

$\boxed{\frac{1}{\omega C} \gg \omega L}$

$\left(R - \frac{j}{\omega C}\right)$

16

$\omega^2 \ll \left(\frac{1}{LC}\right)$

$16 \ll 8$

$0.6\cos(4t - 36.87°) = v_R(t)$

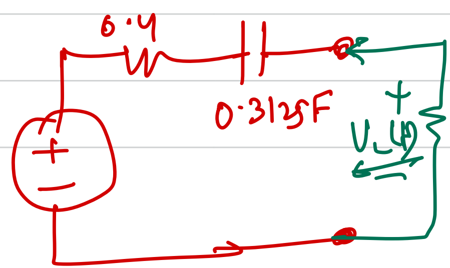
$R = 0.4$

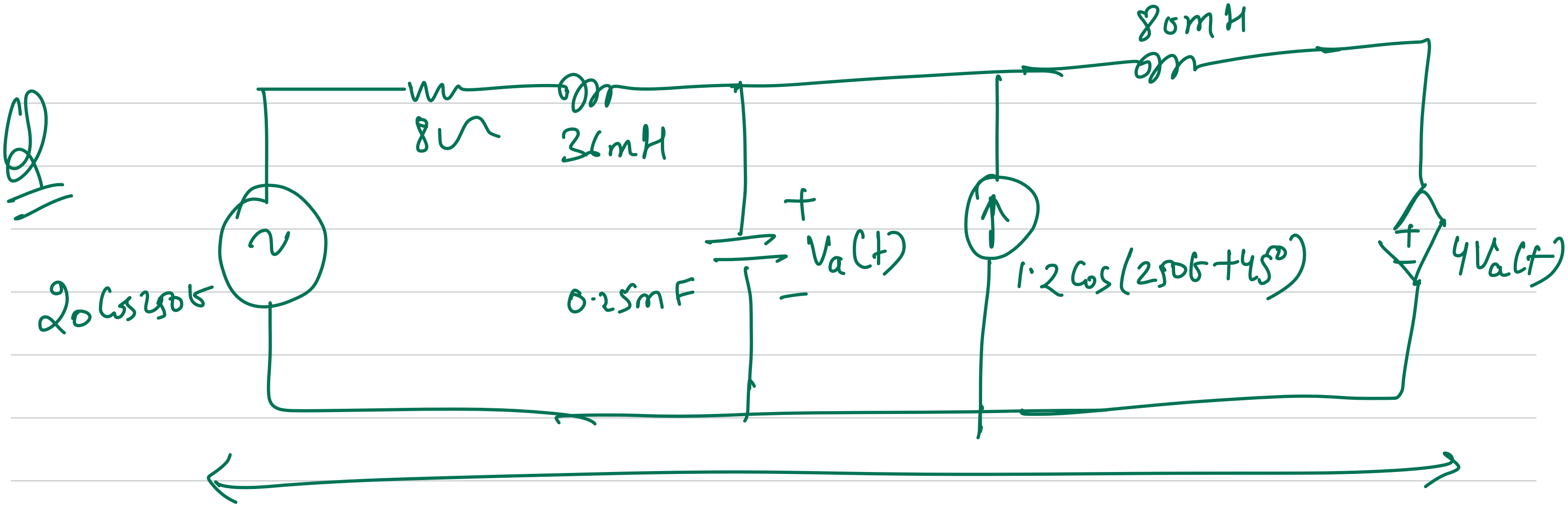
$C = 0.3125F$

$v_R(t) = 0.6\angle -36.87°$

$= Re\{0.6\angle -36.87°\}$

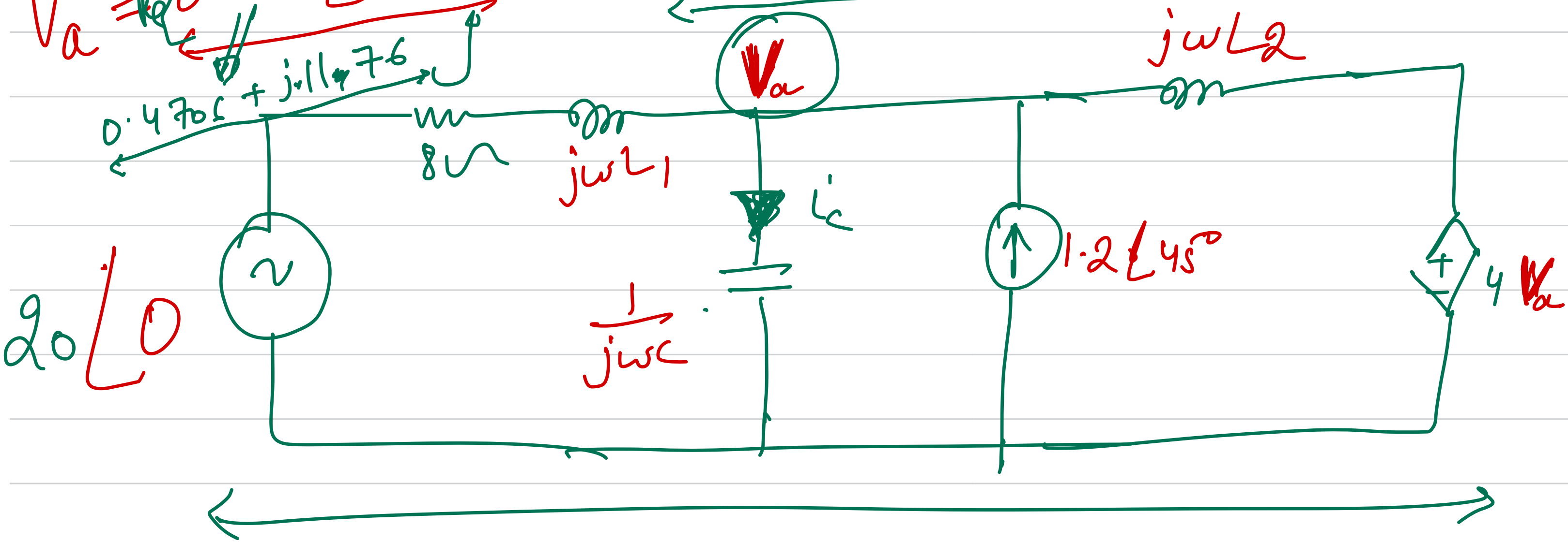
$0.894\angle -63.43$





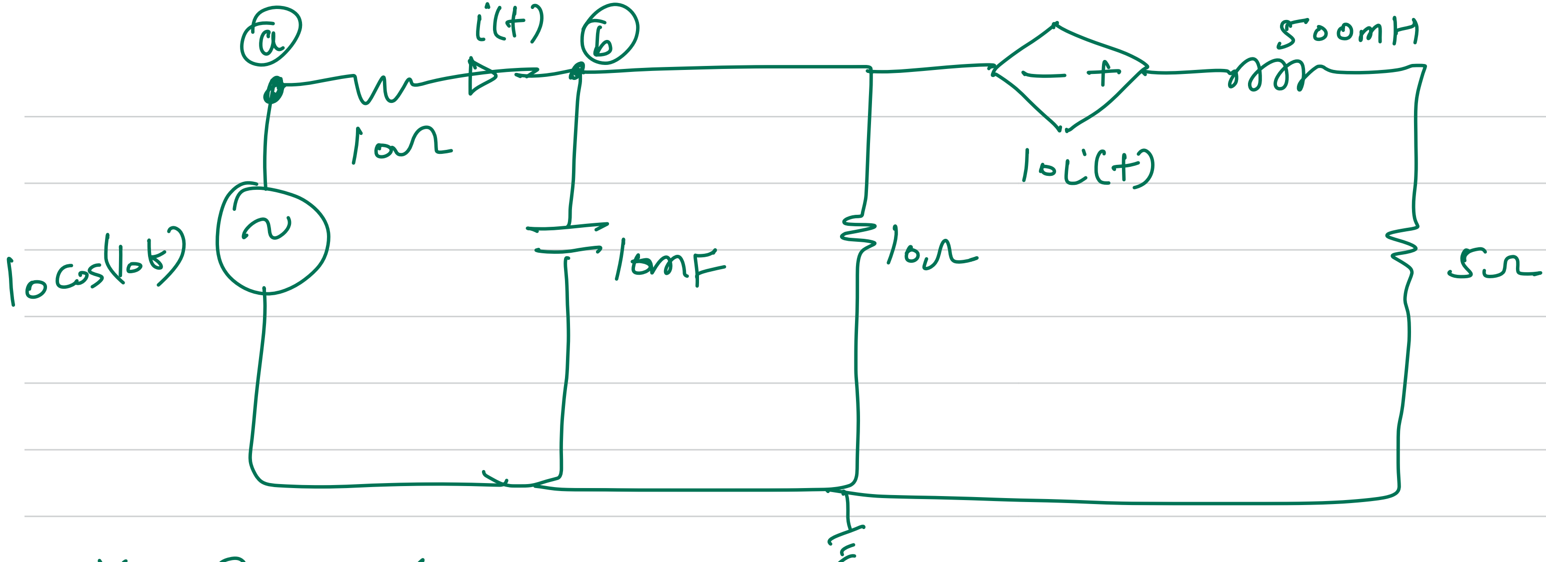
Calculate Va(t) ?

$$V_a = \mathrm{Re}\{0.2636\angle -106.41^\circ\} = 0.2636\cos(250t - 106.41^\circ)$$



$$V_a\left\{\frac{1}{8+j\omega L_1} + j\omega C + \frac{1}{j\omega L_2}\right\} - \frac{20\angle 0}{(8+j\omega L_1)} - \frac{4V_a}{j\omega L_2}$$

$$= 1.2\angle 45^\circ$$



i(t) ?

Nodal Analy / Source Transfm