Quiz - 04

1) V_{out} is leading

$T = 40ms$

$\therefore f = \frac{1}{T} = 0.025\,kHz = 25Hz$

$\Delta t = 5ms = 5 \times 10^{-3}\,s$

$\therefore$ Phase difference, $\Delta\phi$ or $\Delta\theta = 2\pi f \Delta t$

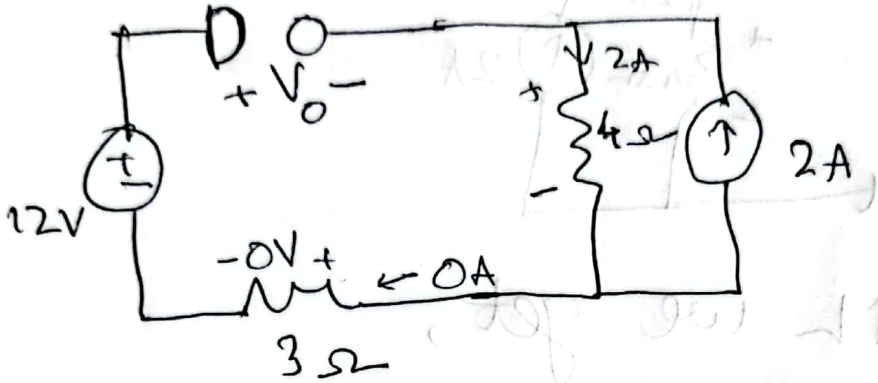
$= \frac{\pi}{4}$ radian

You can also show in degree,

$\Delta\phi = 360^\circ \times f \times \Delta t$

$= 45^\circ$

2) For $t < 0$,

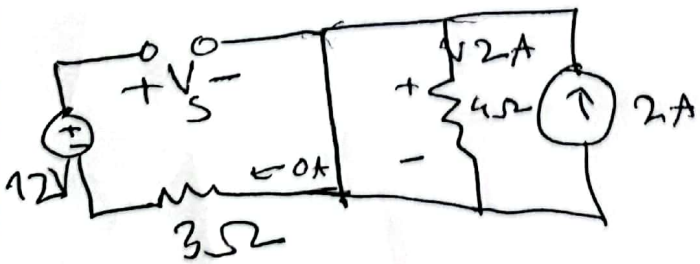


Applying KVL we get,

$$-12 + V_o + 2 \times 4 + 0 = 0$$

or, $V_o = 4V$

For $t > 0$,



$V_s = 12V$

$\tau = 3 \times 2 = 6s$

$$\therefore \text{For } t>0,\ v_c(t) = V_s + (V_0 - V_s)e^{-\frac{t}{\tau}}$$

$$= 12 + (4-12)e^{-\frac{t}{6}}$$

$$= \left(12 - 8e^{-\frac{t}{6}}\right) V$$

$$i_c(t) = C\frac{dv_c(t)}{dt}$$

$$= -8\left(-\frac{1}{6}\right)e^{-\frac{t}{6}} \quad \times 2$$

$$= 2.67e^{-\frac{t}{6}}\ A$$

$$\therefore v_c(t) = \begin{cases} 4V, & t \le 0 \\ 12 - 8e^{-\frac{t}{6}}\ V, & t > 0 \end{cases}$$

$$i_c(t) = \begin{cases} 0A, & t \le 0 \\ 2.67e^{-\frac{t}{6}}\ A, & t > 0 \end{cases}$$