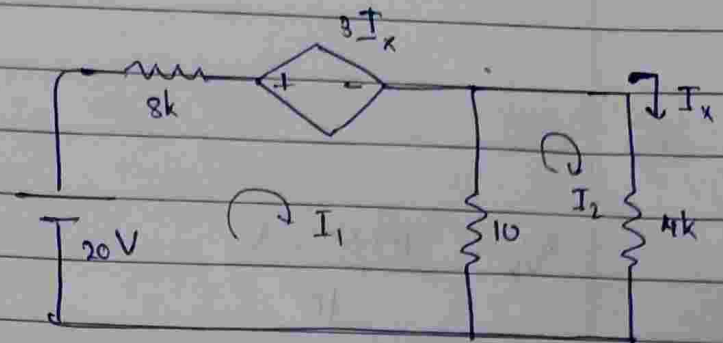


ASSIGNMENT - 2 - SUPERPOSITION

URBAN
EDGE

9/9/2022

due to 20V

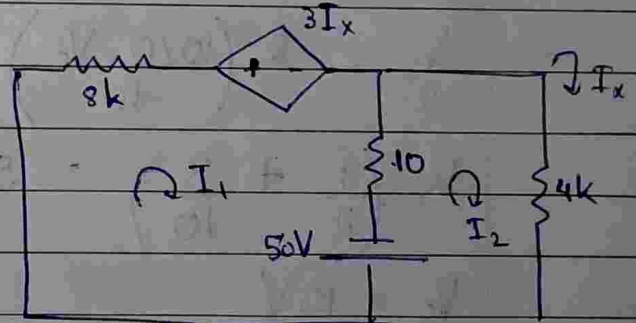


$$I_1(8010) - 10I_2 = 20 - 3I_x$$

$$-10I_1 + 4010I_2 = 0$$

$$I_2 = I_x = 6.23 \times 10^{-6} \text{ A}$$

due to 50V

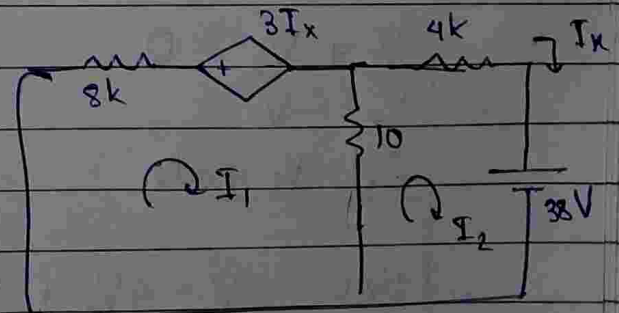


$$50 - 3I_2 = 8010I_1 - 10I_2$$

$$-10I_1 + 4010I_2 = -50$$

$$I_2 = I_x = -0.0125 \text{ A}$$

due to 38V



$$8010I_1 - 10I_2 = -3I_2$$

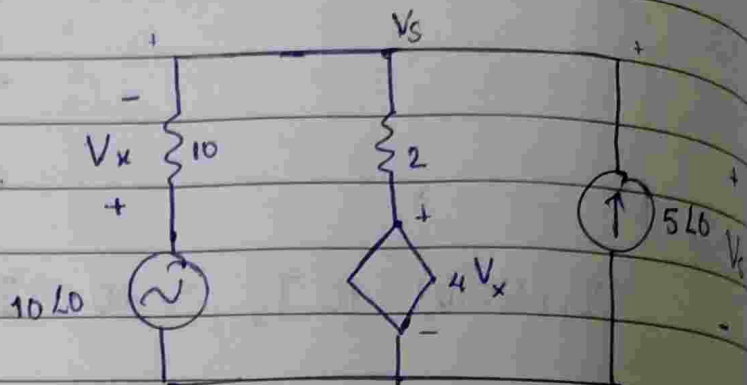
$$-38 = -10I_1 + 4010I_2$$

$$I_2 = I_x = -9.476 \times 10^{-3} \text{ A}$$

$$\therefore \text{Total current} = 6.23 \mu\text{A} - 12.5 \text{ mA} - 9.48 \text{ mA}$$

2)

$$V_x = \frac{10/0 - V_s}{10}$$



due to 10 mA Considering all sources

$$\frac{V_s - 4V_x}{2} + \frac{V_s - 10/0}{10} = 5/0$$

$$\Rightarrow \frac{V_s}{2} - 2 \left(\frac{10/0 - V_s}{10} \right) + \frac{V_s - 10/0}{10} = 5/0$$

$$V_s \left(\frac{1}{2} + \frac{3}{10} \right) = 5/0 + \frac{3 \times 10/0}{10}$$

$$V_s = 10 \text{ V}$$

Considering only 5 mA current source

$$V_s + V_x = 0$$

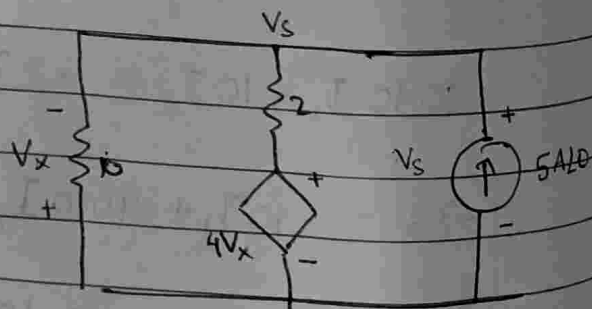
$$\Rightarrow V_x = -V_s$$

At V_s node

$$5/0 = \frac{V_s - 4V_x}{2} + \frac{V_s}{10}$$

$$5/0 = \frac{V_s - 2(-V_s)}{2} + \frac{V_s}{10} \Rightarrow V_s = \frac{5/0}{\frac{1}{2} + 2 + \frac{1}{10}}$$

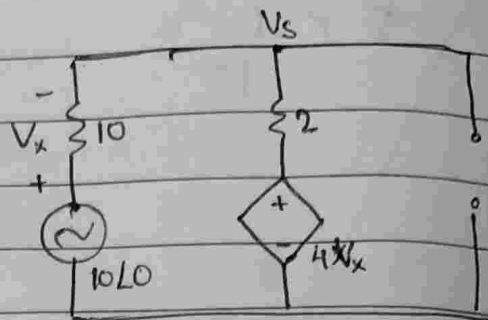
$$V_s = 1.92 \text{ A} \quad \text{--- (1)}$$



Considering only 10V LO source

$$\frac{10 \angle 0 - V_s}{10} = V_x$$

✓



At node V_s

$$\frac{V_s - 10 \angle 0}{10} + \frac{V_s - 4V_x}{2} = 0$$

$$\frac{V_s - 10 \angle 0}{10} + \frac{V_s - 2 \left(\frac{10 \angle 0 - V_s}{10} \right)}{2} = 0$$

$$\frac{1}{10} V_s \left(-\frac{1}{10} + \frac{1}{2} + \frac{2}{10} \right) = \frac{10 \angle 0}{10} + \frac{20 \angle 0}{10}$$

$$\Rightarrow V_s = 8.076 \cong 8.08 \text{ V} \quad \text{--- ②}$$

Adding up ① and ②

$$\begin{aligned} V_{s \text{ total}} &= 8.08 + 1.92 \\ &= 10 \text{ V} \end{aligned}$$