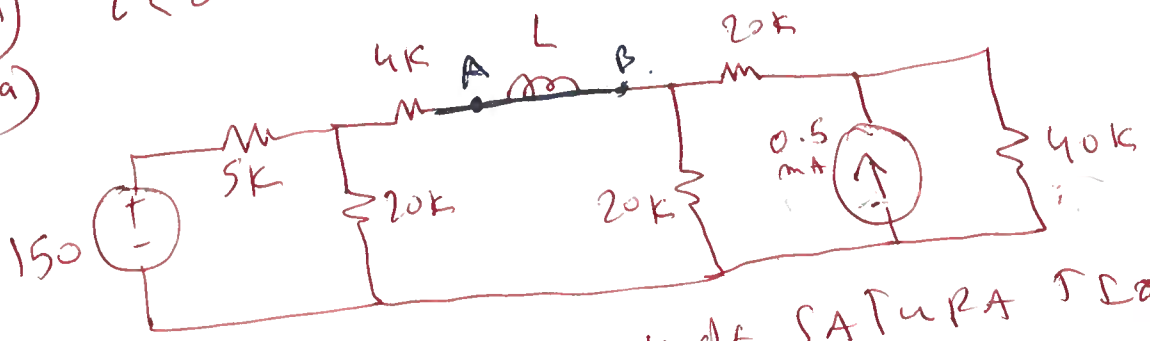
11) $t<0$

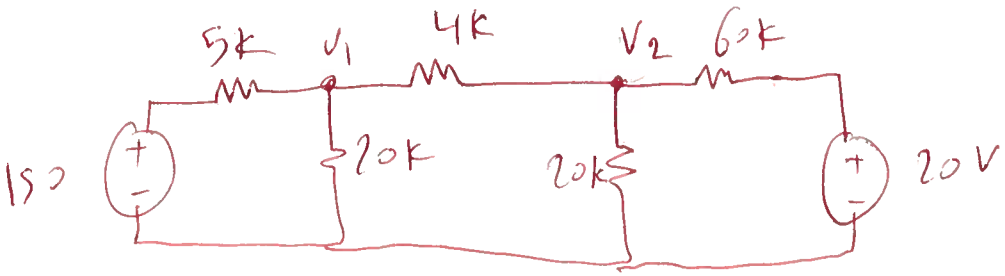
a)



L ACT AS S.C. UNDER SATURATION

∴ WE CAN REPLACE L WITH a SHORT CIRCUIT

WE CAN USE ANY METHOD to SOLVE for $I_{(0)}$



Apply NODAL ANA.

$$\frac{150 - V_1}{5K} = \frac{V_1}{20K} + \frac{V_1 - V_2}{4K} \quad \text{at } V_1$$

$$\frac{V_1 - V_2}{4K} = \frac{V_2}{20K} + \frac{V_2 - 20}{60K} \quad \text{at } V_2$$

at V_1: $600 - 4V_1 = V_1 + 5V_1 - 5V_2$

$$10V_1 - 5V_2 = 600$$

at V_2: $15V_1 - 15V_2 = 3V_2 + V_2 - 20$

$$15V_1 - 19V_2 = -20$$

$$V_1 = \frac{60 + 5V_2}{10} = 6 + 0.5V_2$$

$$15[6 + 0.5V_2] - 19V_2 = -20$$

$$900 + 7.5V_2 - 19V_2 = -20$$

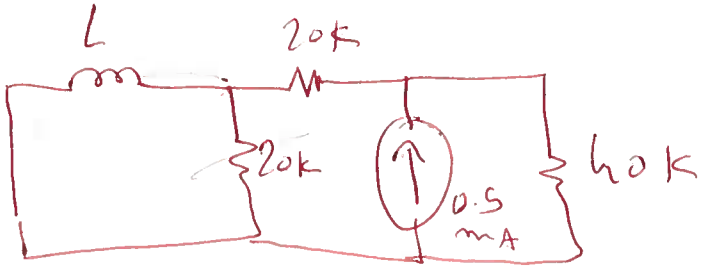
$$11.5V_2 = 920 \Leftrightarrow V_2 = 80V$$

$$V_1 = 6 + 0.5V_2 = 6 + 40 = 100V$$

$$I_o = \frac{V_1 - V_2}{4K} = \frac{100 - 80}{4000} = \frac{20}{4000} = 0.005A$$

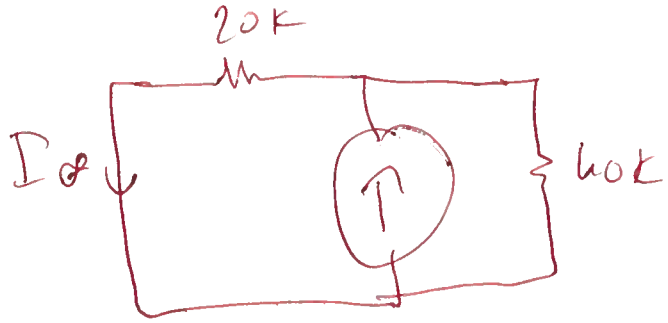
in THE CIRCUIT $i_{(0)} = -0.005A$

b) $t \geq 0$



THE FINAL ~~VALUE~~ MEANS L ACT as S.C.

∴ THE CIRCUIT CAN BE PRESENTED;



using C.D.R $I_\infty = \frac{40K \times 0.5mA}{60K} = 0.334mA$

c) TIME CONSTANT

$$\tau = \frac{L}{R}$$

R is THE R_{TH} ACROSS THE INDUCTOR

$$R_{TH} = \frac{(20k+40k)20k}{20k+20k+40k} = \frac{60k \times 20k}{80k} = 15k$$

$(20k+40k) \| 20k$

$$\tau = \frac{75 \cdot 10^{-3}}{15 \cdot 10^{3}} = 5 \cdot 10^{-6}$$

d) $i(t) = i(\infty) + [i_0 - i(\infty)] e^{-\frac{t}{\tau}}$

$$i(t) = 0.334mA + [-0.005A - 0.334mA] e^{\frac{-t}{5 \cdot 10^{-6}}}$$