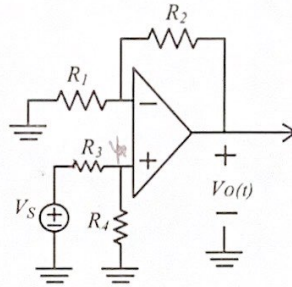


AY110 - Electric Circuits – Second Examination

1. According to the following circuit, determine the $v_o(t)$. (7%)

$$V_o = \frac{R_4(R_1+R_2)}{R_1(R_3+R_4)} v_s$$



$$\frac{V_p}{R_4} + \frac{V_p - v_o}{R_3} = 0$$

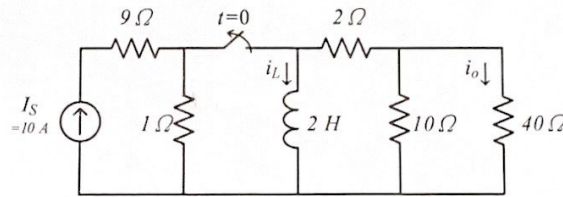
$$V_p = \frac{R_3 v_o}{R_3 + R_4}$$

$$\frac{v_s}{R_1} + \frac{R_3 v_p - v_o}{R_2} = 0$$

2. Based on the following circuit, determine the $i_L(t)$ and $i_o(t)$. (7%)

$$i_L(t) = 10^{-5} t \text{ A}$$

$$i_o(t) = -2e^{-5t}$$



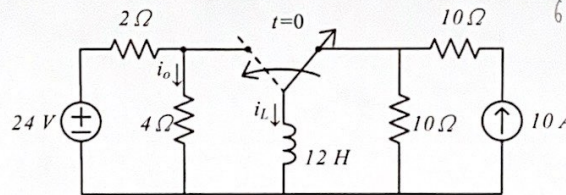
$$V_p(R_1+R_2) = v_o R_1$$

$$v_o = \frac{R_1+R_2}{R_1} \times \frac{R_3}{R_3+R_4} v_s$$

3. Based on the following circuit, determine the $i_L(t)$ and $i_o(t)$. (7%)

$$i_L(t) = 12 - 2e^{-\frac{t}{9}}$$

$$i_o(t) = \frac{2}{3} e^{-\frac{t}{9}}$$

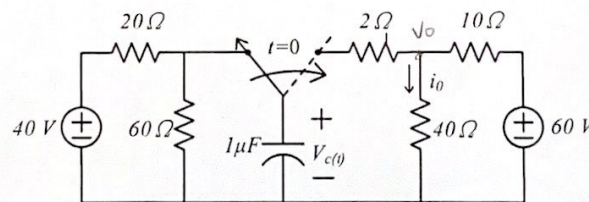


$$\frac{24}{6} = 4$$

$$-4 + \frac{2}{3} e^{-\frac{t}{9}}$$

4. According to the following circuit, determine the $v_c(t)$ and $i_o(t)$. (Hint: using superposition to determine $i_o(t)$). (7%)

$$v_c(t) = 48 - 18e^{-10^5 t}$$



$$6 - \frac{6}{5} = 4.8$$

$$\frac{240}{240} = \frac{80}{42}$$

$$11.2 - 0.36e^{-10^5 t}$$

$$4.8 - 1.8e^{-10^5 t} \times \frac{1}{5}$$

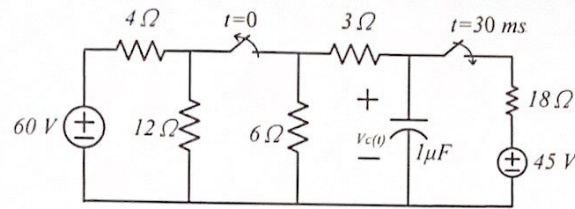
$$0.96 - 0.36e^{-10^5 t}$$

$$\frac{60}{10 + \frac{80}{42}} \times \frac{2}{42}$$

$$= 0.96$$

5. According to the following circuit, determine the $v_c(t)$ when t approaches infinity. (7%)

$$V_c(\infty) = 15V$$



$$\frac{12 \times 6}{12 + 6} = \frac{12 \times 6}{18} = 4 \Omega$$

$$V_c(0) = 30V$$

$$V_c(\infty) = 0$$

$$\tau = 9 \times 10^{-6}$$

$$v_c(t) = 30 e^{-\frac{10^6}{9} t}$$

$$V_c(30ms) = 30 e^{-\frac{10^6}{9} \times 30 \times 10^{-3}} = 0$$

$$V_c(\infty) = 15$$