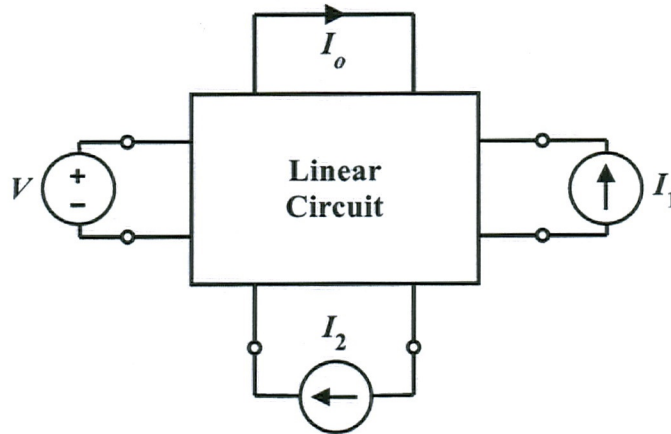


EE 2240
Homework Problem #24



$I_o = 20 \text{ mA}$ when $V = 2 \text{ V}$, $I_1 = 0 \text{ A}$ and $I_2 = 2 \text{ A}$.

$I_o = 30 \text{ mA}$ when $V = 5 \text{ V}$, $I_1 = 2 \text{ A}$ and $I_2 = 1 \text{ A}$.

$I_o = 50 \text{ mA}$ when $V = 6 \text{ V}$, $I_1 = 3 \text{ A}$ and $I_2 = 5 \text{ A}$.

What will I_o be when $V = 5 \text{ V}$, $I_1 = 8 \text{ A}$ and $I_2 = 4 \text{ A}$?

Assume $I_o = K_1 V + K_2 I_1 + K_3 I_2$

Then

$$K_1(2) + K_2(0) + K_3(2) = 0.02$$

$$K_1(5) + K_2(2) + K_3(1) = 0.03$$

$$K_1(6) + K_2(3) + K_3(5) = 0.05$$

or, in matrix form:

$$\begin{bmatrix} 2 & 0 & 2 \\ 5 & 2 & 1 \\ 6 & 3 & 5 \end{bmatrix} \begin{bmatrix} K_1 \\ K_2 \\ K_3 \end{bmatrix} = \begin{bmatrix} 0.02 \\ 0.03 \\ 0.05 \end{bmatrix}$$

Solving yields:

$$K_1 = 0.006, K_2 = -0.002, K_3 = 0.004$$

$$\text{or } I_o = 0.006 V - 0.002 I_1 + 0.004 I_2$$

\therefore With the new input values:

$$I_o = 0.006(5) - 0.002(8) + 0.004(4) = 30 \text{ mA}$$