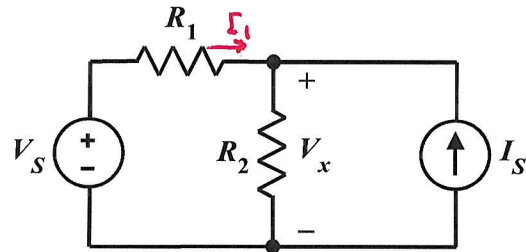


EE 2240
Homework Problem #032



V_x can be described by the equation

$$V_x = \alpha I_S + \beta V_S$$

Determine α and β in terms of the resistor values.

$$I_1 = \frac{V_S - V_x}{R_1}$$

$$V_x = R_2 (I_1 + I_S)$$

$$= \frac{R_2}{R_1} (V_S - V_x) + R_2 I_S$$

$$\Rightarrow \left(1 + \frac{R_2}{R_1}\right) V_x = \frac{R_2}{R_1} V_S + R_2 I_S$$

$$V_x = \frac{R_2}{R_1 \left(1 + \frac{R_2}{R_1}\right)} V_S + \frac{R_2}{\left(1 + \frac{R_2}{R_1}\right)} I_S$$

$$= \frac{R_2}{R_1 + R_2} V_S + \frac{R_1 R_2}{R_1 + R_2} I_S$$

$$\alpha = \frac{R_2}{R_1 + R_2}$$

$$\beta = \frac{R_1 R_2}{R_1 + R_2}$$