

3.

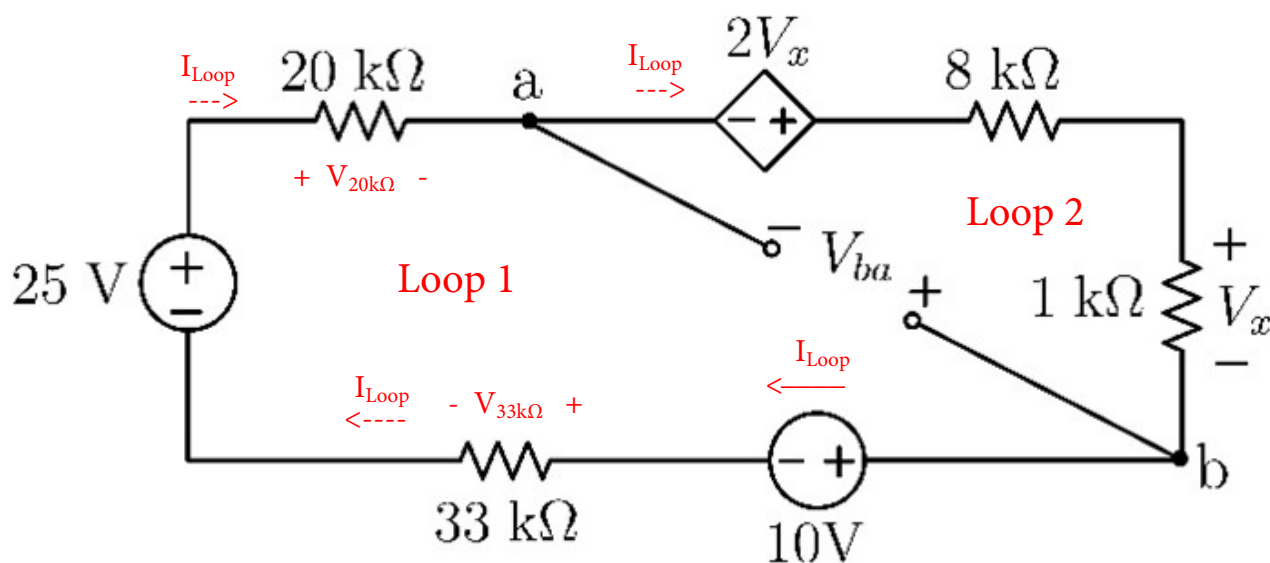
In the circuit shown below, the 10-V source absorbs 2.5 mW of power.

Calculate (a) V_{ba} and (b) the power of the dependent voltage source in this circuit figure and determine if this power is absorbed or generated (use appropriate polarity in your entry to indicate if the power is absorbed or generated).

[6 points for correct answers, 19 points for process work]

$$V_{ba} = \boxed{-1.75 \pm 3\%} \text{ V}$$

$$P = \boxed{-0.125 \pm 3\%} \text{ mW}$$



- (1) 10V source absorbs 2.5 mW

$$P = V \cdot I_{\text{Loop}} = 10 \cdot I_{\text{Loop}} = 0.0025$$

$$I_{\text{Loop}} = 0.25 \text{ mA}$$

- (2) Resistor Voltages

$$V_{33\text{k}\Omega} = I_{\text{Loop}} \cdot 33\text{k}\Omega = 0.25 \text{ mA} \cdot 33\text{k}\Omega = 8.25 \text{ V}$$

$$V_{20\text{k}\Omega} = I_{\text{Loop}} \cdot 20\text{k}\Omega = 0.25 \text{ mA} \cdot 20\text{k}\Omega = 5 \text{ V}$$

$$V_{8\text{k}\Omega} = I_{\text{Loop}} \cdot 8\text{k}\Omega = 0.25 \text{ mA} \cdot 8\text{k}\Omega = 2 \text{ V}$$

$$V_{1\text{k}\Omega} = I_{\text{Loop}} \cdot 1\text{k}\Omega = 0.25 \text{ mA} \cdot 1\text{k}\Omega = 0.25 \text{ V}$$

$$V_x = V_{1\text{k}\Omega} = 0.25 \text{ V}$$

- (1) KVL @ Loop 1 for V_{ba}

$$V_{ba} = 10 \text{ V} + V_{33\text{k}\Omega} - 25 \text{ V} + V_{20\text{k}\Omega}$$

$$V_{ba} = 10 \text{ V} + 8.25 \text{ V} - 25 \text{ V} + 5 \text{ V} = -1.75 \text{ V}$$

$$V_{ba} = -1.75 \text{ V}$$

- (2) Power in dependent voltage source

$$P = V \cdot I = 2V_x \cdot (-I_{\text{Loop}}) = 2(0.25 \text{ V}) \cdot (-0.25 \text{ mA})$$

$$P = -0.125 \text{ mW}$$