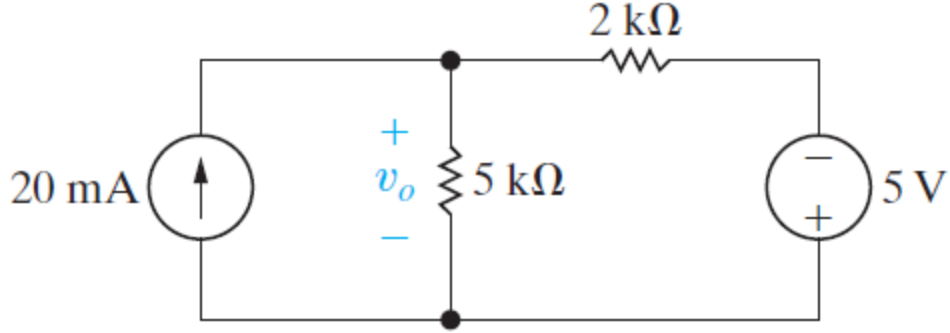


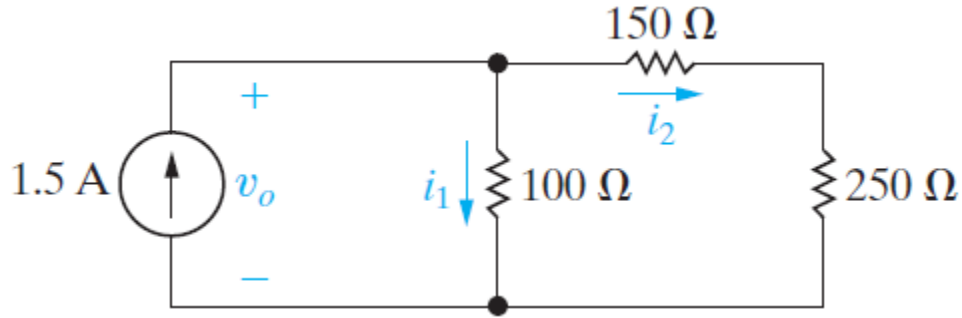
1	2	TOPLAM

BU TABLOYU İLK CEVAP KÂĞIDINIZDA SAĞ ÜSTE ÇİZİP BOŞ BIRAKTIĞINIZ SORU VARSA X İLE GÖSTERİNİZ LÜTFEN. CEVAPLARINIZI AÇIKÇA VERİNİZ.

1.(10p)Devredeki V_o gerilimini ve kaynaklardaki güçleri bulunuz. Üreten mi tüketen mi belirleyiniz.



2. (10p)Devredeki V_o gerilimini, i_1 ve i_2 akımlarını hesaplayınız. Güç dengesini gösteriniz.

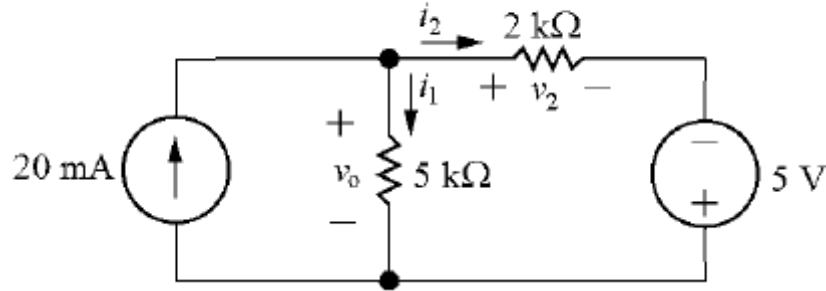


1	2	TOPLAM

BU TABLOYU İLK CEVAP KÂĞIDINIZDA SAĞ ÜSTE ÇİZİP BOŞ BIRAKTIĞINIZ SORU VARSA X İLE GÖSTERİNİZ LÜTFEN. CEVAPLARINIZI AÇIKÇA VERİNİZ.

Cözüm 1:

Label the unknown resistor currents and voltages:



$$\text{KCL at the top node: } 0.02 = i_1 + i_2$$

$$\text{KVL around the right loop: } -v_o + v_2 - 5 = 0$$

Use Ohm's law to write the resistor voltages in the previous equation in terms of the resistor currents:

$$-5000i_1 + 2000i_2 - 5 = 0 \quad \rightarrow \quad -5000i_1 + 2000i_2 = 5$$

Multiply the KCL equation by -2000 and add it to the KVL equation to eliminate i_2 :

$$-2000(i_1 + i_2) + (-5000i_1 + 2000i_2) = -2000(0.02) + 5 \quad \rightarrow \quad -7000i_1 = -35$$

Solving,

$$i_1 = \frac{-35}{-7000} = 0.005 = 5 \text{ mA}$$

Therefore,

$$v_o = Ri_1 = (5000)(0.005) = 25 \text{ V}$$

$$p_{20\text{mA}} = -(0.02)v_o = -(0.02)(25) = -0.5 \text{ W}$$

$$i_2 = 0.02 - i_1 = 0.02 - 0.005 = 0.015 \text{ A}$$

$$p_{5\text{V}} = -(5)i_2 = -(5)(0.015) = -0.075 \text{ W}$$

$$p_{5\text{k}} = 5000i_1^2 = 5000(0.005)^2 = 0.125 \text{ W}$$

$$p_{2\text{k}} = 2000i_2^2 = 2000(0.015)^2 = 0.45 \text{ W}$$

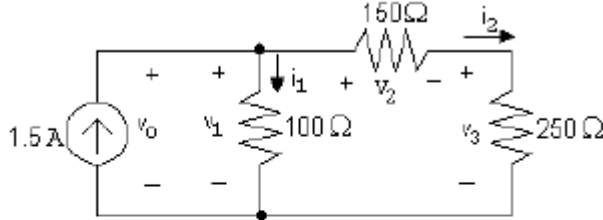
$$p_{\text{total}} = p_{20\text{mA}} + p_{5\text{V}} + p_{5\text{k}} + p_{2\text{k}} = -0.5 - 0.075 + 0.125 + 0.45 = 0$$

Thus the power in the circuit balances.

1	2	TOPLAM

BU TABLOYU İLK CEVAP KÂĞIDINIZDA SAĞ ÜSTE ÇİZİP BOŞ BIRAKTIĞINIZ SORU VARSA X İLE GÖSTERİNİZ LÜTFEN. CEVAPLARINIZI AÇIKÇA VERİNİZ.

Cözüm 2:



[a] Write a KCL equation at the top node:

$$-1.5 + i_1 + i_2 = 0 \quad \text{so} \quad i_1 + i_2 = 1.5$$

Write a KVL equation around the right loop:

$$-v_1 + v_2 + v_3 = 0$$

From Ohm's law,

$$v_1 = 100i_1, \quad v_2 = 150i_2, \quad v_3 = 250i_2$$

Substituting,

$$-100i_1 + 150i_2 + 250i_2 = 0 \quad \text{so} \quad -100i_1 + 400i_2 = 0$$

Solving the two equations for i_1 and i_2 simultaneously,

$$i_1 = 1.2 \text{ A} \quad \text{and} \quad i_2 = 0.3 \text{ A}$$

[b] Write a KVL equation clockwise around the left loop:

$$-v_o + v_1 = 0 \quad \text{but} \quad v_1 = 100i_1 = 100(1.2) = 120 \text{ V}$$

$$\text{So} \quad v_o = v_1 = 120 \text{ V}$$

[c] Calculate power using $p = vi$ for the source and $p = Ri^2$ for the resistors:

$$p_{\text{source}} = -v_o(1.5) = -(120)(1.5) = -180 \text{ W}$$

$$p_{100\Omega} = 1.2^2(100) = 144 \text{ W}$$

$$p_{150\Omega} = 0.3^2(150) = 13.5 \text{ W}$$

$$p_{250\Omega} = 0.3^2(250) = 22.5 \text{ W}$$

$$\sum P_{\text{dev}} = 180 \text{ W} \quad \sum P_{\text{abs}} = 144 + 13.5 + 22.5 = 180 \text{ W}$$