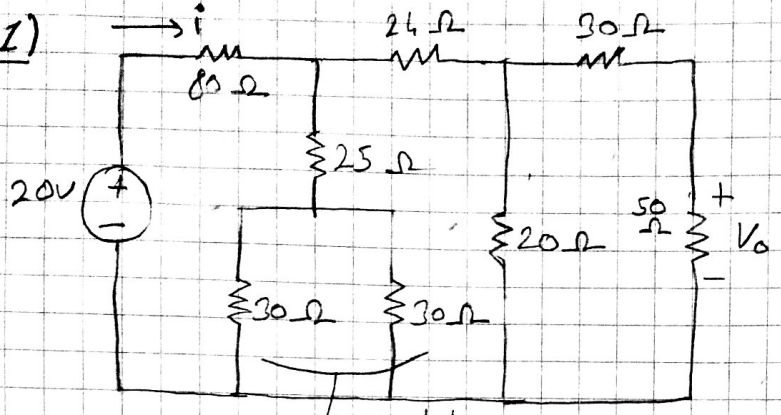
Bilgi Sayar Mühendisliği Devre Teorileri

İsmail Kayvan
2019131710 30

I.

Vize Ödevi

Soru 1)

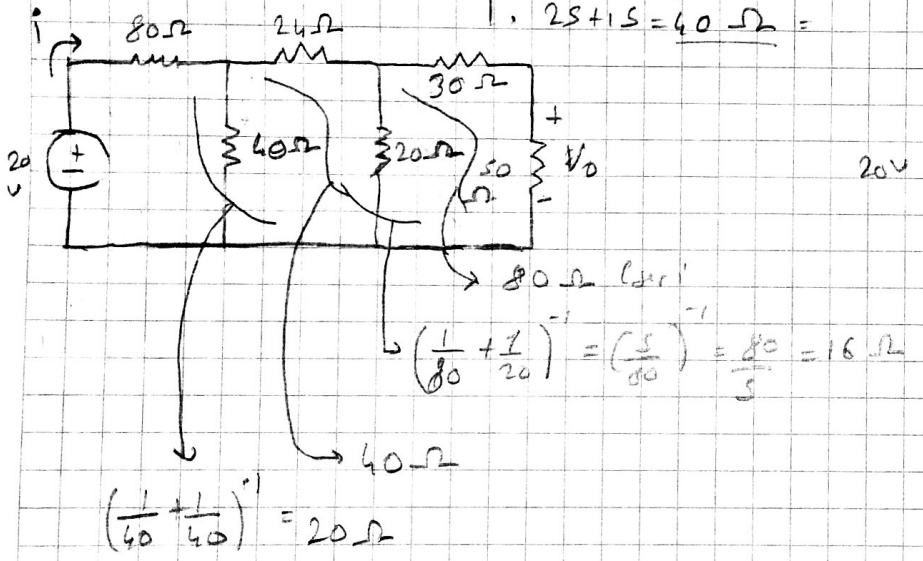


i, Vo = ?

↳ Paralel

$R_{eş} = \left(\frac{1}{30} + \frac{1}{30}\right)^{-1} = 15\,\Omega$

$25 + 15 = 40\,\Omega =$

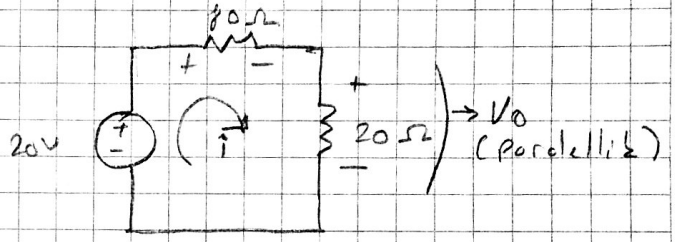


80 Ω (ters)

$\left(\frac{1}{80} + \frac{1}{20}\right)^{-1} = \left(\frac{5}{80}\right)^{-1} = \frac{80}{5} = 16\,\Omega$

40 Ω

$\left(\frac{1}{40} + \frac{1}{40}\right)^{-1} = 20\,\Omega$



$-20 + 80i + 20i = 0$

$100i = 20$

$i = \frac{20}{100}$

$\boxed{i = 0{,}2\ A}$

$\boxed{V_o = 50(0{,}2) = 10\ V}$

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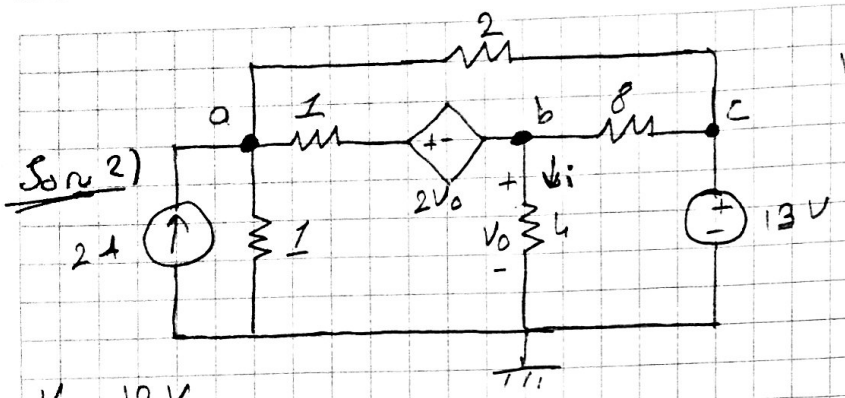
Soru 2)



$V_0 = ?$

$V_c = 13\,V$

Düğüm a

$$-2 + \frac{(V_a - (2V_0 + V_b))}{1} + \frac{V_a}{1} + \frac{V_a - V_c}{2} =$$

$$V_a + \frac{V_a - V_c}{2} + V_a - 2V_0 - V_b = 2 \quad (2)$$

$$2V_a + V_a - 13 + 2V_a - 4V_0 - 2V_b = 4$$

$$5V_a - 2V_b - 4V_0 = 17$$

Düğüm b

$$V_b - (-2V_0 + V_a) + \frac{V_b - V_c}{8} + \frac{V_b}{4} = 0$$

$$V_b + 2V_0 - V_a + \frac{V_b - V_c}{8} + \frac{V_b}{4} = 0 \quad (8)\ (2)$$

$$8V_b + 16V_0 - 8V_a + V_b - V_c + 2V_b = 0 \quad (V_c \to 13V)$$

$$11V_b - 8V_a + 16V_0 = 13$$

$V_0 = 4i$ $\quad \frac{V_b}{4} = i$

$V_0 = 4\frac{V_b}{4} = V_b$ yerine yazalım.

$V_0 = V_b$ bulunur, yerine yazalım.

$$27V_b - 8V_a = 13 \quad / 5$$

$$-6V_b + 5V_a = 17 \quad / 8$$

$$135V_b - 40V_a = 65$$

$$+ \quad -48V_b + 40V_a = 136$$

$$87V_b = 201$$

$$V_b = \frac{201}{87}$$

$V_b = 2,31\,V = V_0$

$\boxed{V_0 = 2,31\,V}$

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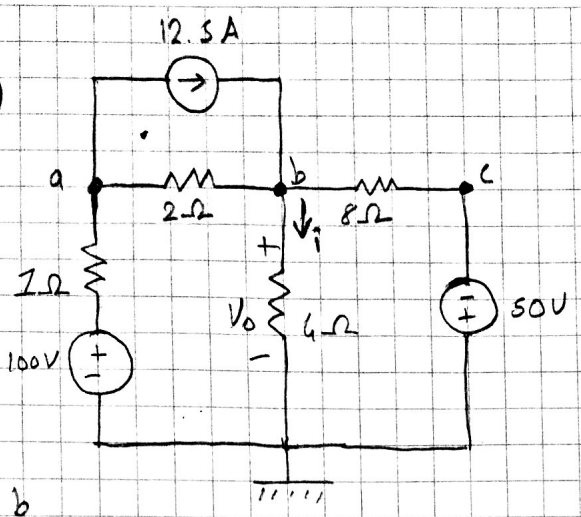
Soru 3)



$V_o = ?$

Düğüm a

$$\frac{V_a - 100}{1} + \frac{V_a - V_b}{2} = -12,5$$

$$2V_a - 200 + V_a - V_b = -25$$

$$\boxed{3V_a - V_b = 175}$$

$$\boxed{V_c = -50V}$$

Düğüm b

$$\frac{V_b - V_a}{2} + \frac{V_b}{4} + \frac{V_b - V_c}{8} = 12,5$$

$$4V_b - 4V_a + 2V_b + V_b - \underbrace{V_c}_{-(-50)} = 12,5(8) = 100$$

$$\boxed{7V_b - 4V_a = 50}$$

$$\frac{V_b - 0}{4} = i \qquad V_o = 4i$$

$$V_o = 4\frac{V_b}{4} = V_b$$

$$\boxed{V_b = V_o = 50V}$$

$3V_a - V_b = 175 \quad /4$

$-4V_a + 7V_b = 50 \quad /3$

$12V_a - 4V_b = 700$

$-12V_a + 21V_b = 150$

$+$

$17V_b = 850$

$V_b = 50V$

$3V_a - \overset{50}{V_b} = 175$

$3V_a = 225$

$V_a = 75V$