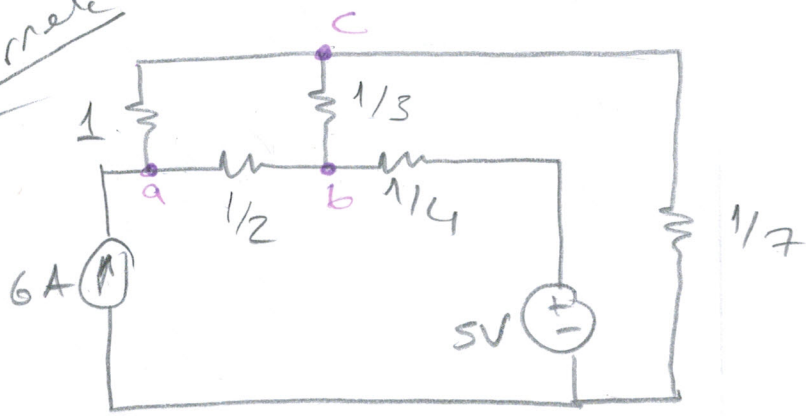
Örnek




Düğüm a:

$$-6 + \frac{V_a - V_c}{1} + \frac{V_a - V_b}{1/2} = 0$$

Düğüm b

$$\frac{V_b - V_a}{1/2} + \frac{V_b - V_c}{1/3} + \frac{V_b - 5}{1/4} = 0$$

Düğüm c

$$\frac{V_c - V_a}{1} + \frac{V_c - V_b}{1/3} + \frac{V_c}{1/7} = 0$$

Düğüm a = $-6 + V_a - V_c + 2V_a - 2V_b = 0$

$3V_a - 2V_b - V_c = 6$

Düğüm b = $2V_b - 2V_a + 3V_b - 3V_c + 4V_b - 20 = 0$

$-2V_a + 9V_b - 3V_c = 20$

Düğüm c = $V_c - V_a + 3V_c - 3V_b + 7V_c = 0$

$-V_a - 3V_b + 11V_c = 0$

$V_a = 11V_c - 3V_b$

$3.(11V_c - 3V_b) - 2V_b - V_c = 6$

$33V_c - 9V_b - 2V_b - V_c = 6$

$32V_c - 11V_b = 6 \quad \cdots (1)$

$-2(11V_c - 3V_b) + 9V_b - 3V_c = 20$

$-22V_c + 6V_b + 9V_b - 3V_c = 20$

$15V_b - 25V_c = 20 \quad \cdots (2)$

15/ $32V_c - 11V_b = 6$

11/ $-25V_c + 15V_b = 20$

$\rightarrow$ $480V_c - 165V_b = 90$

$-275V_c + 165V_b = 220$

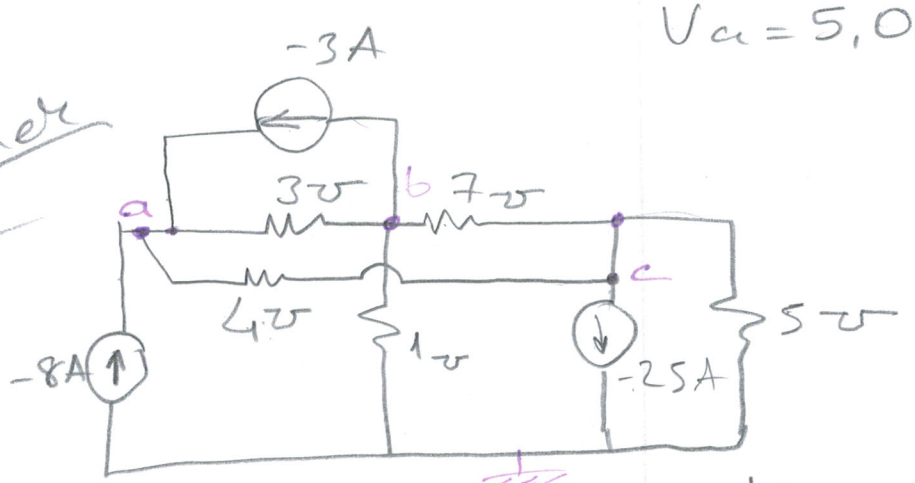
$205V_c = 310$

$V_c = 1.51V$

7-2

$V_a = 5,06V$ $V_b = 3,85V$

Örnek




$G = \frac{1}{R} \Rightarrow \Omega$ direnç

iletkenlik

Devrey: düğüm analizi yöntemi ile matematik modelini kuruyor?

Düğüm a: $-(-8) + (V_a - V_c)4 + (V_a - V_b)3 - (-3) = 0$

$8 + 4V_a - 4V_c + 3V_a - 3V_b + 3 = 0$

$7V_a - 3V_b - 4V_c = -11$

Düğüm b $-3 + (V_b - V_a)3 + V_b + (V_b - V_c)7 = 0$

$3V_b - 3V_a + V_b + 7V_b - 7V_c = 3$

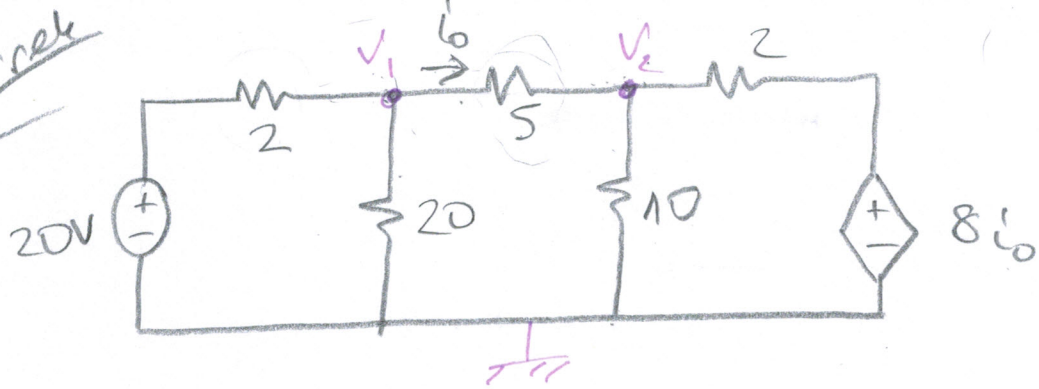
$-3V_a + 11V_b - 7V_c = 3$

Düğüm c $-25 + (V_c - V_a)4 + (V_c - V_b)7 + 5V_c = 0$

$4V_c - 4V_a + 7V_c - 7V_b + 5V_c = 25$

$-4V_a - 7V_b + 16V_c = 25$

Örnek




$i_o = ?$

$\frac{V}{R} = i$

Düğüm 1

$$\frac{V_1 - 20}{2} + \frac{V_1}{20} + \frac{V_1 - V_2}{5} = 0$$

10 1 4

$$10V_1 - 200 + V_1 + 4V_1 - 4V_2 = 0$$

$$15V_1 - 4V_2 = 200 \quad \leftarrow \text{---} (1)$$

Düğüm 2

$$\frac{V_2 - V_1}{5} + \frac{V_2}{10} + \frac{V_2 - 8i_o}{2} = 0$$

2 5

$$2V_2 - 2V_1 + V_2 + 5V_2 - 40i_o = 0$$

$$-2V_1 + 8V_2 - 40i_o = 0$$

$$\frac{V_1 - V_2}{5} = i_o$$

$$-2V_1 + 8V_2 - 8V_1 + 8V_2 = 0$$

$$16V_2 = 10V_1$$

$$10V_1 = 16V_2$$

$$V_1 = 1{,}6V_2 \quad \text{---} (2)$$

(2)'yi (1)'de yerine koyarsak

$15V_1 - 4V_2 = 200$ , $V_1 = 1,6V_2$

$\rightarrow 24V_2 - 4V_2 = 200$

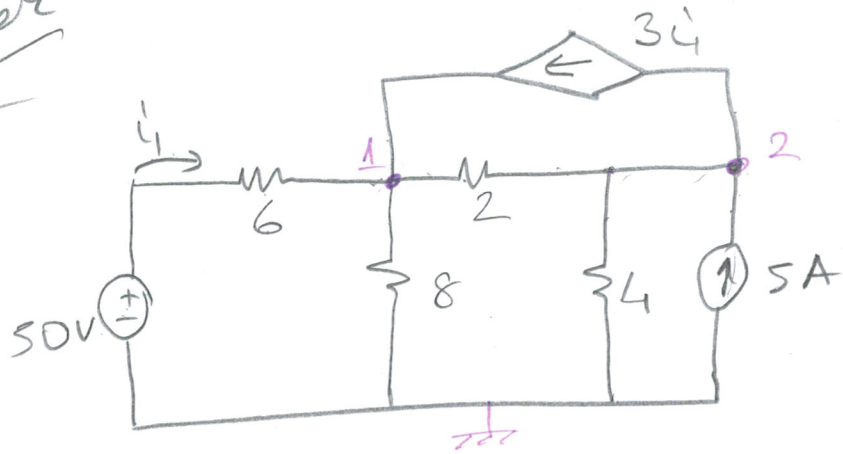
$20V_2 = 200$

$V_2 = 10V$

$V_1 = 16V$

$i_0 = \frac{V_1 - V_2}{5} = \frac{16-10}{5} = 1,2A$

Örnek




$i_1 = ?$

$i_1 = \frac{50 - V_1}{6}$

Düğüm 1 $\quad \frac{V_1 - 50}{6} + \frac{V_1}{8} + \frac{V_1 - V_2}{2} - 3i_1 = 0$

4 3 12 24

$4V_1 - 200 + 3V_1 + 12V_1 - 12V_2 = 72i_1$

$19V_1 - 12V_2 - 72 \cdot \left(\frac{50 - V_1}{6}\right) = 200$

$19V_1 - 12V_2 + 12V_1 = 800$

$31V_1 - 12V_2 = 800$

Düğüm 2 $\quad 3i_1 - 5 + \frac{V_2}{4} + \frac{V_2 - V_1}{2} = 0$

$12i_1 - 20 + V_2 + 2V_2 - 2V_1 = 0$

$2 \cdot 12\left(\frac{50 - V_1}{6}\right) + 3V_2 - 2V_1 = 20$

$\rightarrow 100 - 2V_1 + 3V_2 - 2V_1 = 20$

$-4V_1 + 3V_2 = -80$

$-4/4V_1 - 3V_2 = 80$

$\rightarrow 1/31V_1 - 12V_2 = 800$

$-16V_1 + 12V_2 = -320$

$31V_1 - 12V_2 = 800$

$15V_1 = 480$

$V_1 = 32V$

$4V_1 - 3V_2 = 80$

$4.32 - 3V_2 = 80$

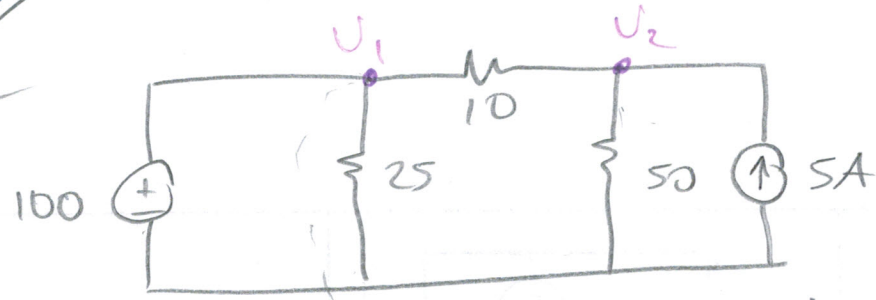
$3V_2 = 48$

$V_2 = 16V$

$i_1 = \frac{50 - V_1}{6}$

$= \frac{50 - 32}{6} =$

Ornek




$V_1 = 100V$

$\frac{V_2 - V_1}{10} + \frac{V_2}{50} - 5 = 0$

$5V_2 - 500 + V_2 = 250$

$6V_2 = 750$

$V_2 = 125V$