

ÇÖZÜMLER = (1)

1-) $i = \frac{\partial q}{\partial t}$ old.'nu biliyoruz.

$t = 1 \text{ ms için ; } i = \frac{\partial q}{\partial t} = \frac{80-0}{2-0} = 40 \text{ A}$

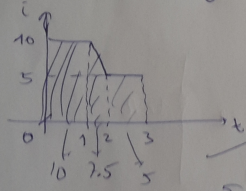
$t = 6 \text{ ms için ; } i = \frac{\partial q}{\partial t} = \frac{80-80}{8-2} = 0 \text{ A}$

$t = 10 \text{ ms için ; } i = \frac{\partial q}{\partial t} = \frac{0-80}{12-8} = -20$

2-) $i = \frac{dq}{dt}$ old.'den $\Rightarrow \int i dt = \int \frac{dq}{dt} dt \Rightarrow q = \int i dt$

$t = 1 \text{ s için ; } q = \int_0^1 i dt = \int_0^1 10 dt = 10 + 1 = 10 \text{ C}$

$t = 3 \text{ s için ; } q = \int_0^3 i dt = \int_0^1 i dt + \int_1^3 i dt = \int_0^1 10 dt + \int_1^3 5 dt = 10 + 7.5 = 17.5 \text{ C}$



$10 + 7.5 + 5 = 22.5 \text{ C}$

$t = 5 \text{ s için ; } q = \int_0^5 i dt = \int_0^1 i dt + \int_1^3 i dt + \int_3^5 i dt = 10 + 7.5 + 5 = 22.5 \text{ C}$

$22.5 + 7.5 = 30 \text{ C}$

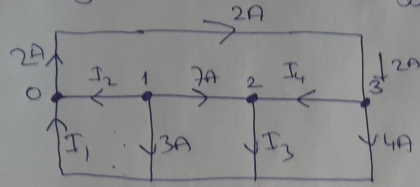
3-) Devrede güç korunumundan;

$\sum P_i = 0$ olmalıdır.

$6 \cdot (-30) + 6 \cdot 12 + 3 \cdot V_0 + 1 \cdot 28 + 2 \cdot 28 + 10 \cdot (-3) = 0$ olmalıdır.

$-180 + 72 + 3V_0 + 28 + 56 - 30 = 0$
 $3V_0 = 210 - 156 = 54 \Rightarrow V_0 = \frac{54}{3} = 18 \text{ V}$

4.) Düzüm noktalarında KCL uygularsak;



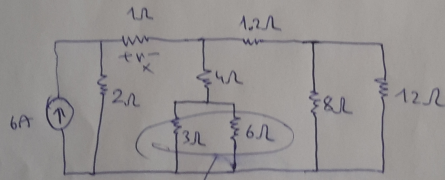
(3)'te KCL'den ; $2 = I_4 + 4 \Rightarrow I_4 = -2A$

(1)'de KCL'den ; $I_2 + 7 + 3 = 0 \Rightarrow I_2 = -10A$

(0)'da KCL'den ; $I_1 + I_2 = 2 \Rightarrow I_1 = 12A$

(2)'de KCL'den ; $7 + I_4 = I_3 \Rightarrow I_3 = 5A$

5-)



paralel old. $\Rightarrow R_{eq} = 2\Omega$

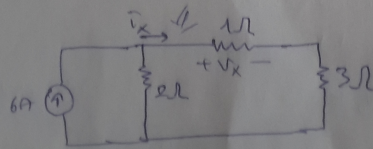
2Ω ve 4Ω seri $\Rightarrow 2 + 4 = 6\Omega$

8Ω ve 12Ω paralel $\Rightarrow 4.8\Omega$

12Ω ve 4.8Ω seri $\Rightarrow 1.2 + 4.8 = 6\Omega$

iki paralel

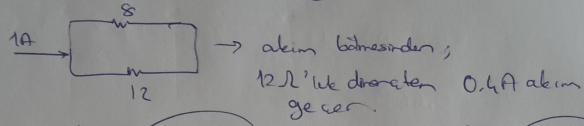
3Ω



Akım bölmesinden, (2)

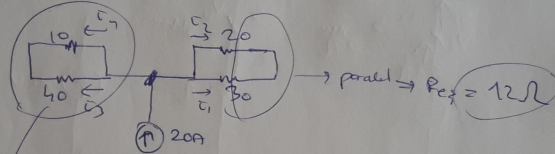
$$i_x = 2A \text{ ve } V_x = 0.2 = 1.2 \text{ V}$$

12Ω'lık dirençten 1A akım geçer.

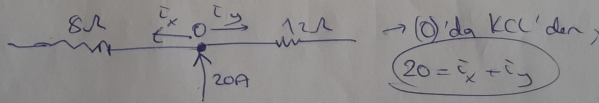


$$V_{12\Omega} = 12 \cdot (0.4) = 4.8V \Rightarrow P = \frac{V^2}{R} = \frac{(4.8)^2}{12} = 1.92W$$

6.)



paralel dd.'den; $\frac{1}{10} + \frac{1}{40} = \frac{1}{R_{eq}} \Rightarrow R_{eq} = 8\Omega$
(4)



akım bölmesinden; $\frac{8}{12} = \frac{2}{3}$ olur.

$$\Rightarrow i_x = 12A \text{ ve } i_y = 8A \text{ bulunur.}$$

$$\frac{i_4}{i_3} = \frac{4}{1} \Rightarrow i_4 = 9.6A \text{ ve } i_3 = 2.4A$$

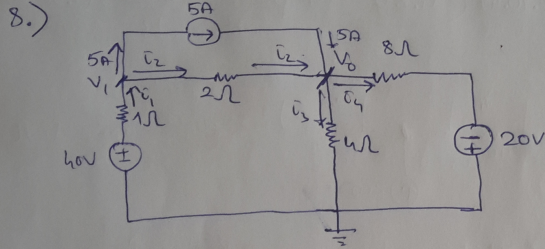
$$\frac{i_2}{i_1} = \frac{3}{2} \Rightarrow i_2 = 4.8A \text{ ve } i_1 = 3.2A$$

7.) Östteki V_0 değeri noktasında KCL uygulanacak;

$$10 = \frac{V_0}{10} + \frac{V_0}{20} + \frac{V_0}{30} + 2 + \frac{V_0}{60} \Rightarrow V_0 = 40V$$

$$\bar{i}_1 = \frac{V_0}{10} = \frac{40}{10} = 4A; \bar{i}_2 = \frac{V_0}{20} = 2A; \bar{i}_3 = \frac{V_0}{30} = 1.33A$$

$$\bar{i}_4 = \frac{V_0}{60} = 0.66A$$



$$(V_1)'de \text{ KCL'den } \Rightarrow \bar{i}_1 = \bar{i}_2 + 5$$

$$(V_0)'da \text{ KCL'den } \Rightarrow \bar{i}_2 + 5 = \bar{i}_3 + \bar{i}_4 \text{ olur.}$$

$$\bar{i}_1 = \frac{40 - V_1}{1}; \bar{i}_2 = \frac{V_1 - V_0}{2}; \bar{i}_3 = \frac{V_0}{4}; \bar{i}_4 = \frac{V_0 - (-20)}{8}$$

$$\bar{i}_4 = \frac{V_0 + 20}{8}$$

$$\frac{40 - V_1}{1} = \frac{V_1 - V_0}{2} + \frac{5}{1} \Rightarrow 80 - 2V_1 = V_1 - V_0 + 10$$

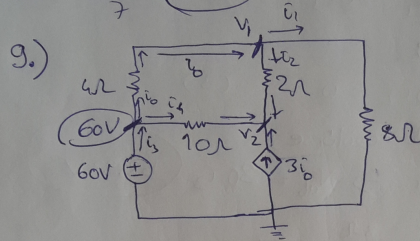
$$\Rightarrow V_0 - 3V_1 = -70 \Rightarrow 3V_1 - V_0 = 70 \dots (1)$$

$$\frac{V_1 - V_0}{2} + \frac{5}{1} = \frac{V_0}{4} + \frac{V_0 + 20}{8} \Rightarrow 4V_1 - 4V_0 + 40 = 2V_0 + V_0 + 20$$

$$\Rightarrow 7V_0 - 4V_1 = 20 \dots (2)$$

$$\begin{aligned} 7/ \quad & 3v_1 - v_0 = 70 \\ & + \quad 7v_0 - 4v_1 = 20 \end{aligned} \Rightarrow 17v_1 = 510 \Rightarrow v_1 = 30V$$

$$\Rightarrow v_0 = \frac{140}{7} = 20V$$



$$(v_1) \text{ 'de KCL'den } \Rightarrow i_0 = i_1 + i_2$$

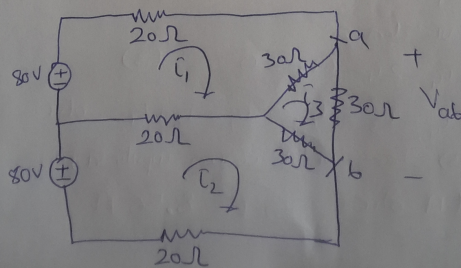
$$(v_2) \text{ 'de KCL'den } \Rightarrow i_2 + i_4 + 3i_0 = 0$$

$$i_0 = \frac{60 - v_1}{4}; \quad i_1 = \frac{v_1}{8}; \quad i_2 = \frac{v_1 - v_2}{2}; \quad i_4 = \frac{60 - v_2}{10}$$

denklemlerde yerine bırakılıp çözüldü;

$$v_1 = 53.08V \Rightarrow i_0 = \frac{60 - v_1}{4} = 1.73A \text{ olarak bulunur}$$

10.)



(1). çevrede KVL'den ;

$$-80 + 70i_1 - 20i_2 - 30i_3 = 0 \dots (1)$$

(2). çevrede KVL'den ;

$$-80 + 70i_2 - 20i_1 - 30i_3 = 0 \dots (2)$$

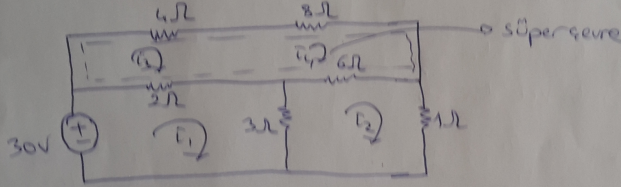
(3). çevrede KVL'den ;

$$90i_3 - 30i_1 - 30i_2 = 0 \dots (3)$$

(1), (2) ve (3) ortak çözümlerse ;

$$i_3 = 1.7778 \text{ A} \text{ olur. } \Rightarrow V_{ab} = 30 \cdot i_3 = 53.33 \text{ V}$$

11.



1. çevrede KVL'den ;

$$-30 + 5i_1 - 2i_3 - 3i_2 = 0 \dots (1)$$

2. çevrede KVL'den ;

$$10i_2 - 3i_1 - 6i_4 = 0 \dots (2)$$

Süperçevrede KVL'den ;

$$6i_3 + 16i_4 - 2i_1 - 6i_2 = 0 \dots (3)$$

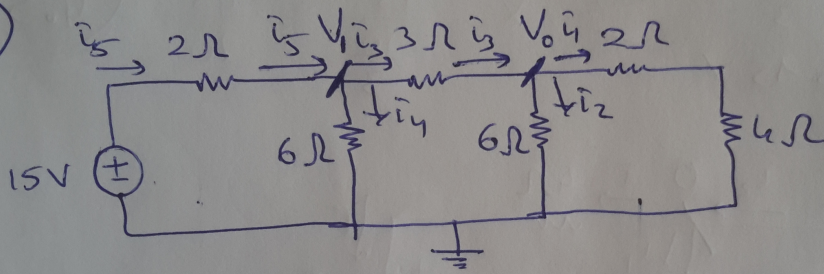
Öte yandan ; $i_4 - i_3 = 4 \Rightarrow i_4 = i_3 + 4$ olur.

(1), (2) ve (3) ten ortak çözüm yapılırsa ;

$$i_1 = 8.561 \text{ A} \text{ olur. } \Rightarrow I = 8.56 \text{ A}$$

(4)

12.)



$$V_0 = 1 \text{ V olsun. } \quad i_1 = \frac{V_0 - 0}{6} = \frac{V_0}{6} = \frac{1}{6} \text{ A}$$

$$i_2 = \frac{V_0 - 0}{6} = \frac{V_0}{6} = \frac{1}{6} \text{ A}$$

(V_0) 'da KCC'den;

$$i_3 = i_1 + i_2 = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3} \text{ A}$$

$$\frac{V_1 - V_0}{3} = \bar{i}_3 = \frac{1}{3} \Rightarrow \frac{V_1 - 1}{3} = \frac{1}{3} \Rightarrow V_1 = 2V$$

$$\bar{i}_4 = \frac{V_1 - 0}{6} = \frac{2}{6} = \frac{1}{3} A$$

(V_1)'de KCL'den;

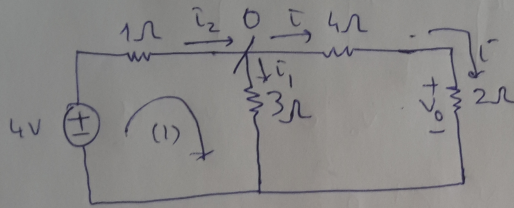
$$\bar{i}_5 = \bar{i}_3 + \bar{i}_4 = \frac{1}{3} + \frac{1}{3} = \frac{2}{3} A$$

$$\frac{V_s - V_1}{2} = \bar{i}_5 = \frac{2}{3} \Rightarrow \frac{V_s - 2}{2} = \frac{2}{3} \Rightarrow V_s = \frac{4}{3} + \frac{2}{1} = \frac{10}{3}$$

$$1V \rightarrow \frac{10}{3} V \quad \Rightarrow \quad x = \frac{15}{\frac{10}{3}} = \frac{45}{10} = 4.5V$$

$$x \rightarrow 15V$$

13.)



$V_0 = 1V$ kabul edersek ;

$i = \frac{1}{2} = 0.5A$ olur. Akım bölünmesinden ;

$i = 0.5 \Rightarrow i_1 = 1A$ olur.

(1)'de KCL'den ;

$$i_2 = i + i_1 = 0.5 + 1 = 1.5A$$

1. devrede KVL'den ;

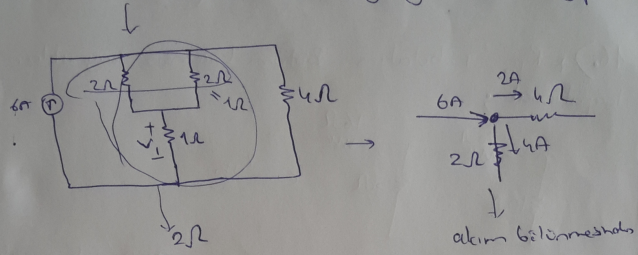
$$-V_s + 3 + 1.5 = 0 \Rightarrow V_s = 4.5V$$

$$1V \rightarrow 4.5V \text{ üze} \Rightarrow x - (4.5) = 4 \Rightarrow x = \frac{4}{4.5}$$

~~$x \sqrt{4.5}$~~ ~~$4V$ iten~~

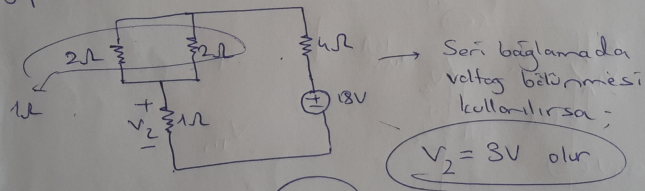
$\Rightarrow x = 0.88V$ olur.

14.) $V_0 = V_1 + V_2$ ve V_1 ; 6A'lık kaynağın etkisi ve V_2 'de 20V'lık kaynağın etkisi olsun.
 *Önce V_1 'i bulalım. 20V'lık kaynağı kısa devre yapalım.

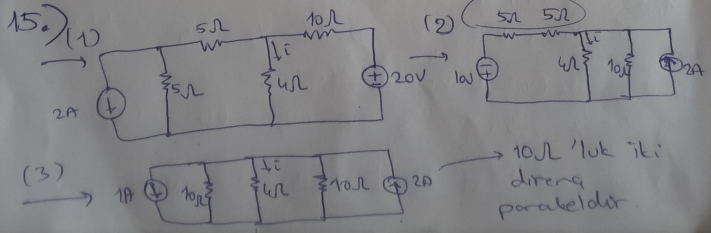


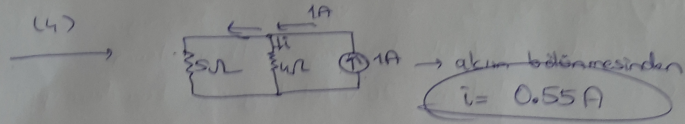
$\Rightarrow V_1 = 4 \cdot 1 = 4V$ olur.

*Şimdi de V_2 'yi bulalım. Akım kaynağına açık devre yapalım.

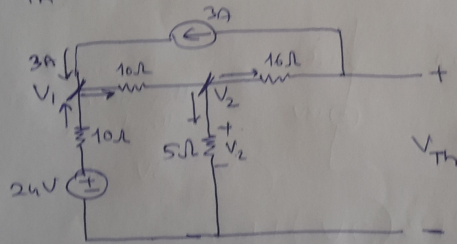
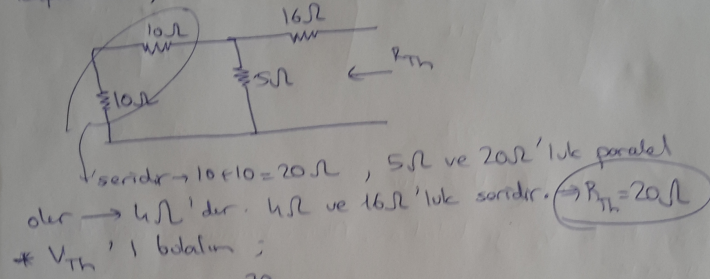


$V_0 = V_1 + V_2 = 4 + 3 = 7V$ bulunur.





16.) * R_{Th} 'i bulalım. Bütün bağımsız kaynakları kapatırsak;



1. düğümde (V_1)'de KCL'den;

$$\frac{24 - V_1}{10} + 3 = \frac{V_1 - V_2}{10} \Rightarrow 2V_1 - V_2 = 54 \quad \text{--- (1)}$$

2. düğümde (V_2)'de KCL'den;

$$\frac{V_1 - V_2}{10} = 3 + \frac{V_2}{5} \Rightarrow 2V_1 - 6V_2 = 60 \quad \text{--- (2)}$$

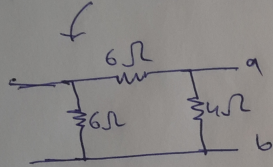
(1) ve (2) taraf tarafa çıkarılırsa;

$$\Rightarrow V_2 = -1.2 \text{ V}$$

$$\text{Öte yandan, } \frac{V_2 - V_{Th}}{16} = 3 \Rightarrow \frac{V_2}{-1.2} - V_{Th} = 48$$

$$\Rightarrow V_{Th} = -49.2 \text{ V}$$

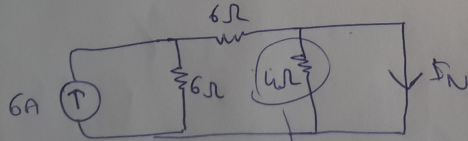
17.) * R_N 'i bulmak için, bağımsız kaynakları kapatırız.



→ 6Ω'lık dirençler seridir.
6 + 6 = 12Ω

12Ω ve 4Ω'lık dirençler paraleldir. → $R_N = 3\Omega$

* I_N 'i bulalım ;



kısa devre yapar.

akım bölünmesinden $\frac{6}{2} = 3\text{A}$ olur.