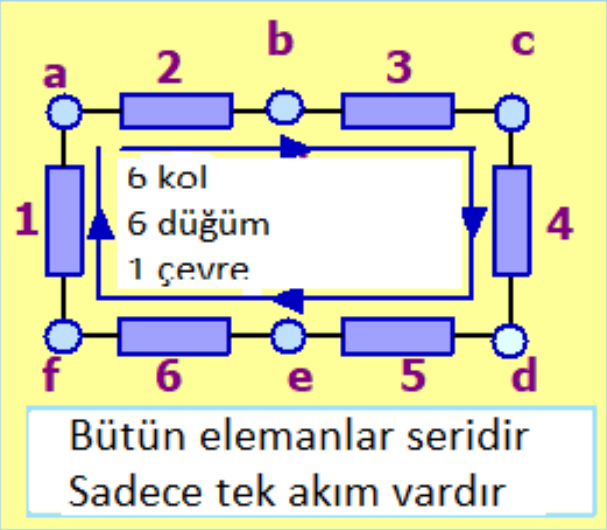
TEK GÖZLÜ DEVRELER

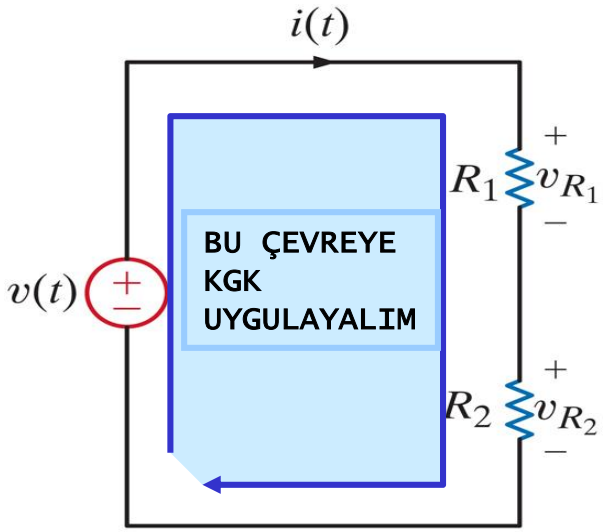
- KGK ve KAK‘nu kullanarak herhangi bir doğrusal devrenin analizinde yeterli denklemleri yazabiliriz.
- Şimdi temel devre kanunlarını kullanarak sistematik ve etkili yolları inceleyelim



5 KAK DENKLEMİ YAZ VEYA SADECE AKIM AKIŞ YÖNÜNÜ BELİRLE

TEK GÖZLÜ DEVRELER

GERİLİM BÖLÜŞÜMÜ: EN BASİT ÖRNEK



KGK $$-v(t) + v_{R_1} + v_{R_2} = 0$$

OHM Kanunu

$$v_{R_1} = R_1 i(t)$$

$$v_{R_2} = R_2 i(t)$$

$$v(t) = R_1 i(t) + R_2 i(t)$$

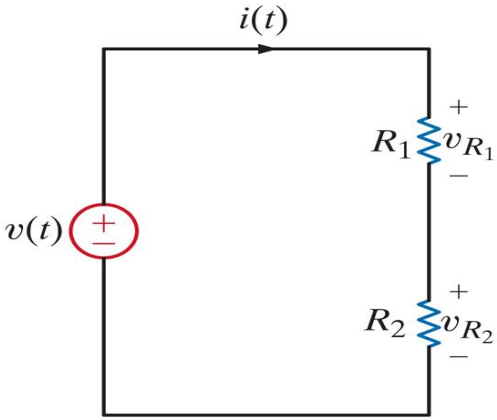
$$i(t) = \frac{v(t)}{R_1 + R_2}$$

$$\begin{aligned} v_{R_1} &= R_1 i(t) \\ &= R_1 \left[\frac{v(t)}{R_1 + R_2} \right] \\ &= \frac{R_1}{R_1 + R_2} v(t) \end{aligned}$$

ÖNEMLİ GERİLİM BÖLÜŞÜM DENKLEMLERİ

$$v_{R_2} = \frac{R_2}{R_1 + R_2} v(t)$$

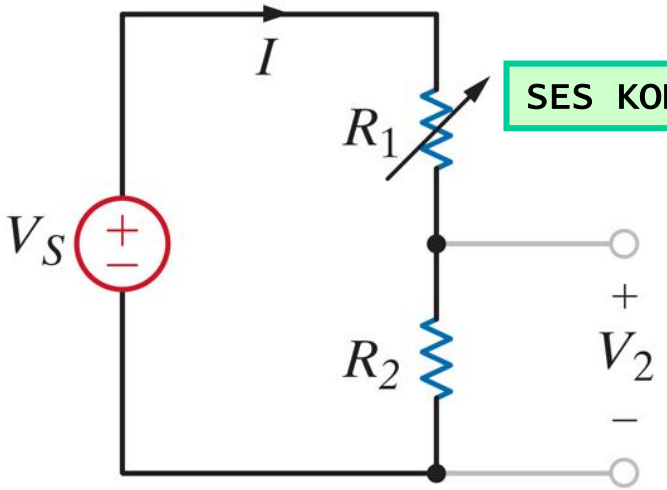
TEMEL GERİLİM BÖLÜCÜ ÖZETİ



$$v_{R_1} = \frac{R_1}{R_1 + R_2} v(t)$$

$$v_{R_2} = \frac{R_2}{R_1 + R_2} v(t)$$

ORNEK : $V_S = 9V, R_1 = 90k\Omega, R_2 = 30k\Omega$



SES KONTROL?

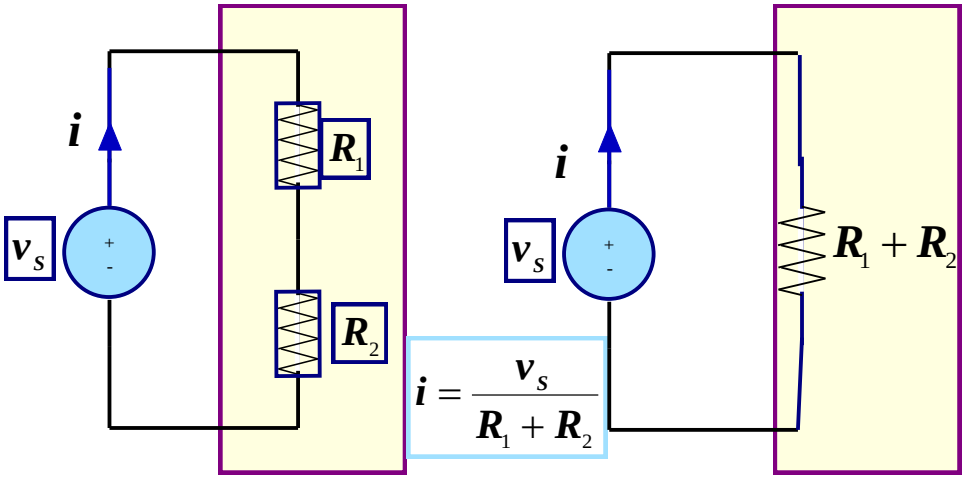
$$V_2 = \left[\frac{R_2}{R_1 + R_2}\right] V_S = \left[\frac{30k}{90k + 30k}\right](9) = 2.25\ V$$

$R_1 = 15k\Omega \Rightarrow$

$$V_2 = \left[\frac{30k}{30k + 15k}\right] 9 = 6\ V$$

EŞDEĞER DEVRE KAVRAMI

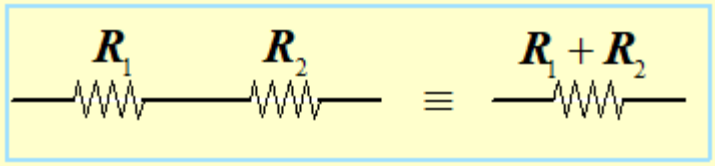
Bu kavram devrelerin analizini basitleştirmek için sıklıkla kullanılacaktır. Burada çok basit bir gerilim bölücü tanıtılmaktadır



$$i = \frac{v_s}{R_1 + R_2}$$

Akım açısından, her iki devre de eşdeğerdir. Sağdaki devre sadece bir dirençlidir

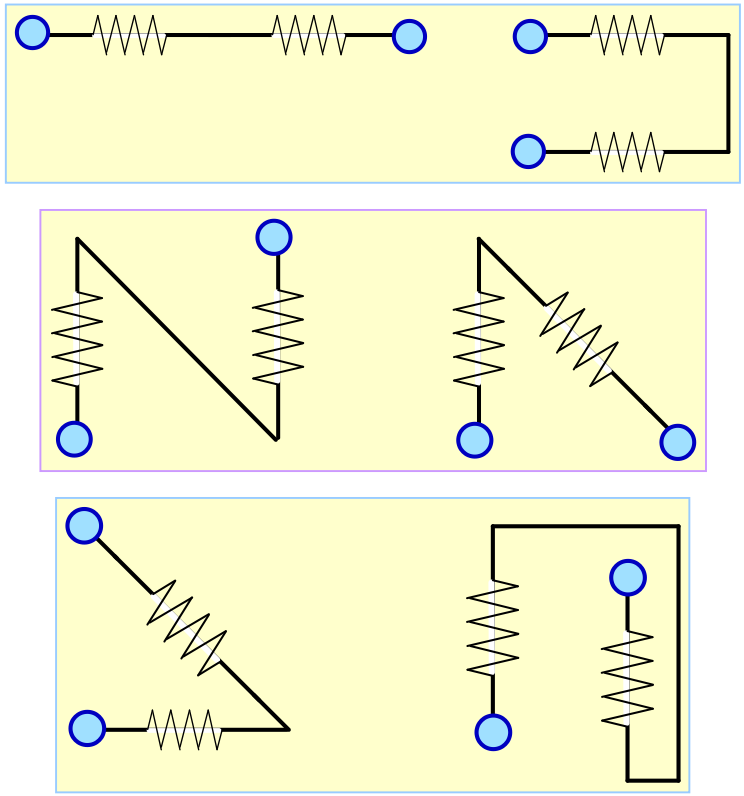
DİRENÇLERİN SERİ BAĞLANMASI



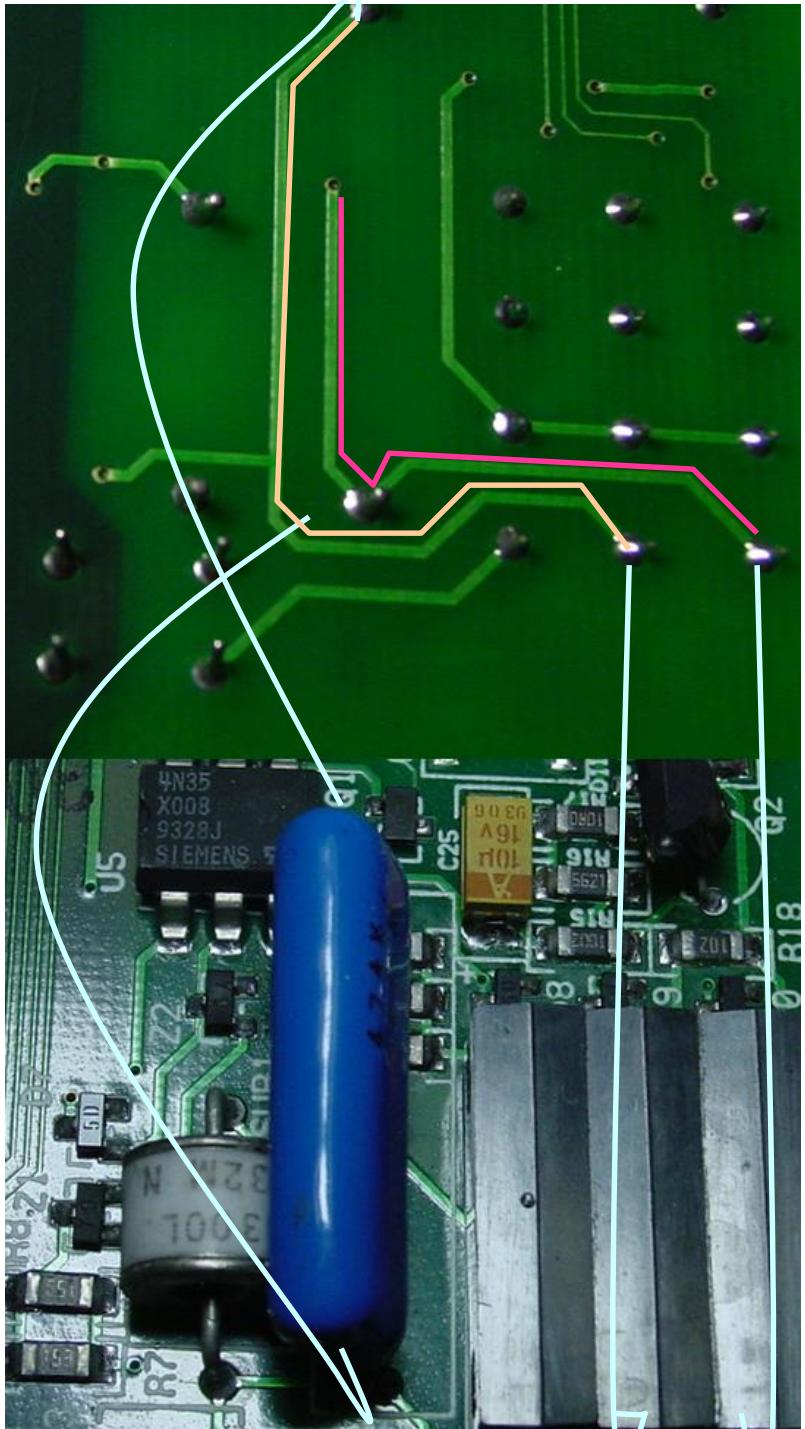
EŞDEĞER DEVRE KAVRAMI

ELEKTRİK BAĞLANTISI VE FİZİKSEL DÜZENLEME ARASINDAKİ FARK

Bazen, pratik yapım nedenleriyle, elektriksel olarak bağlı elemanlar fiziksel olarak tamamen birbirinden ayrı olabilir.



BÜTÜN DURUMLARDA DİRENÇLER SERİ BAĞLIDIRLAR



KONNEKTÖR TARAFI

FİZİKSEL DÜZENLEME İLE ELEKTRİKSEL BAĞLANTILAR ARASINDAKİ FARKIN AÇIKLANMASI

FİZİKSEL DÜĞÜM

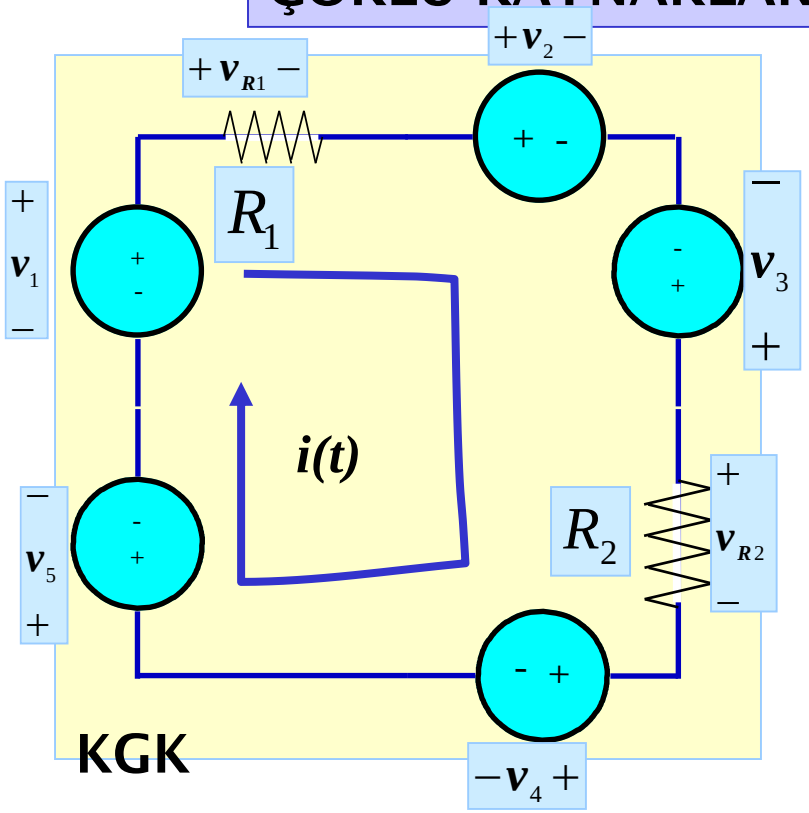
FİZİKSEL DÜĞÜM

14.4 KB SES / VERİ MODEMİ

KARŞILIK GELEN NOKTALAR

ELEMAN TARAFI

ÇOKLU KAYNAKLAR



Eşdeğer bir kaynak oluşturmak için seri bağlı gerilim kaynakları cebirsel olarak eklenebilir.

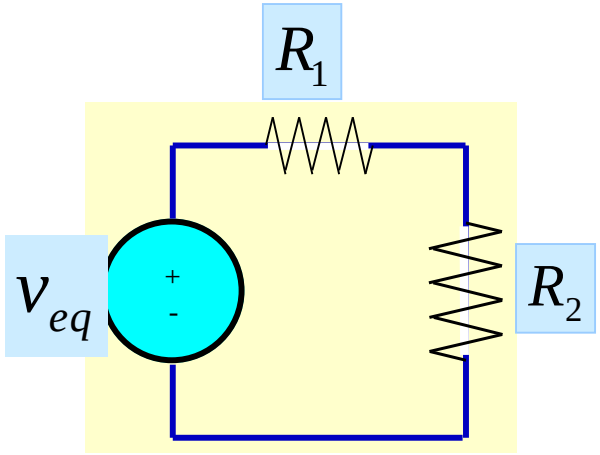
Yol boyunca ilerlemek için referans yön seçilir.
Gerilim düşümleri gerilim yükselmelerinden çıkarılır.

$$v_{R1}+v_2-v_3+v_{R2}+v_4+v_5-v_1=0$$

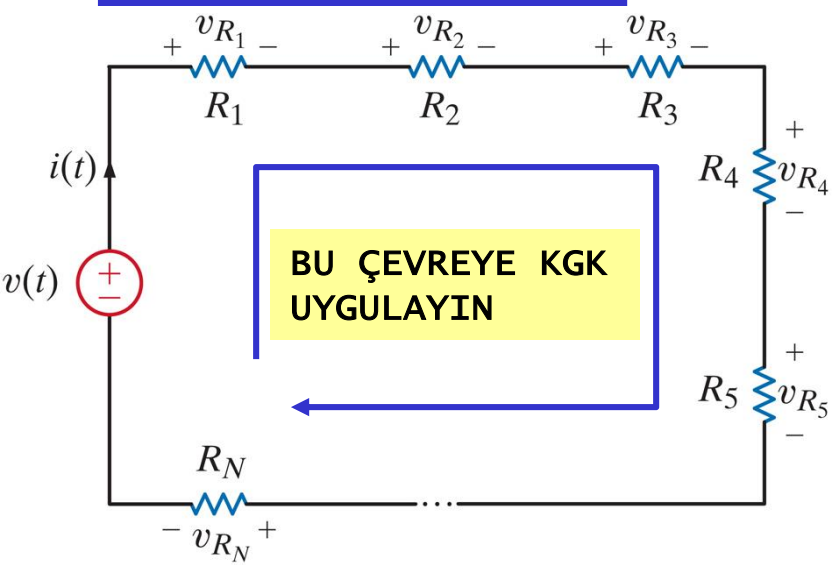
Tüm kaynakları tek tarafta toplayın

$$\left(v_1-v_2+v_3-v_4-v_5\right)=v_{R1}+v_{R2}$$

$$\left(v_{eq}\right)=v_{R1}+v_{R2}$$



ÇOKLU DİRENÇLER



$$v(t) = v_{R_1} + v_{R_2} + \cdots + v_{R_N}$$

OHM KANUNU

$$v(t) = R_1 i(t) + R_2 i(t) + \cdots + R_N i(t)$$

$$R_S = R_1 + R_2 + \cdots + R_N$$

$$i(t) = \frac{v(t)}{R_S}$$

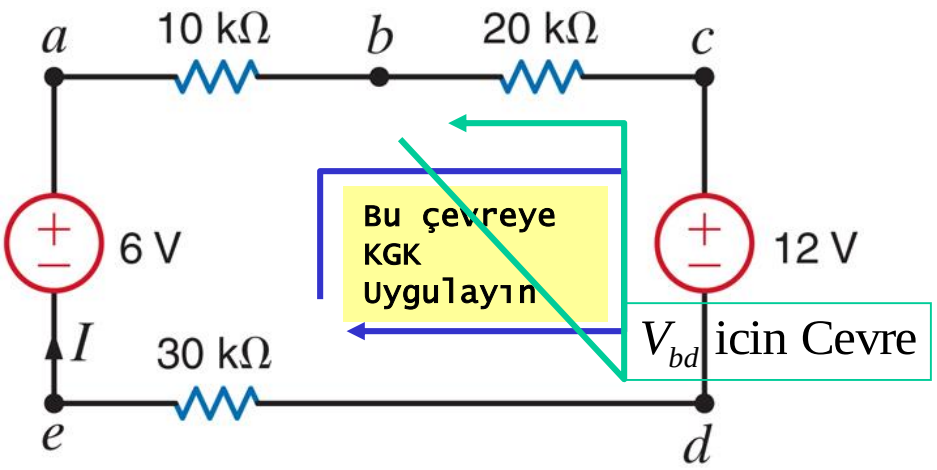
$$v_{R_i} = R_i i \Rightarrow$$

$$v_{R_i} = \frac{R_i}{R_S} v(t)$$

ÇOKLU DİRENÇLER İÇİN GERİLİM BÖLÜŞÜMÜ

ÇOKLU DİRENÇLER

$$I, V_{bd}, P(30k)' yi \ Bulun$$



$$10kI + 20kI + 12 + 30kI - 6 = 0$$

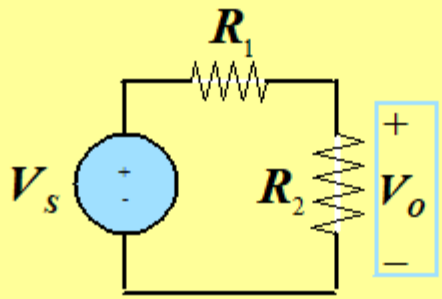
$$I = -0.1 \text{ mA}$$

$$V_{bd} - 12 - 20[k\Omega]I = 0 \text{ (KGK)} \Rightarrow V_{bd} = 10V$$

30k Ω Direnc Icin Güc

$$P = I^2 R = (-10^{-4} A)^2 (30 * 10^3 \Omega) = 30mW$$

"TERS" GERİLİM BÖLÜCÜ



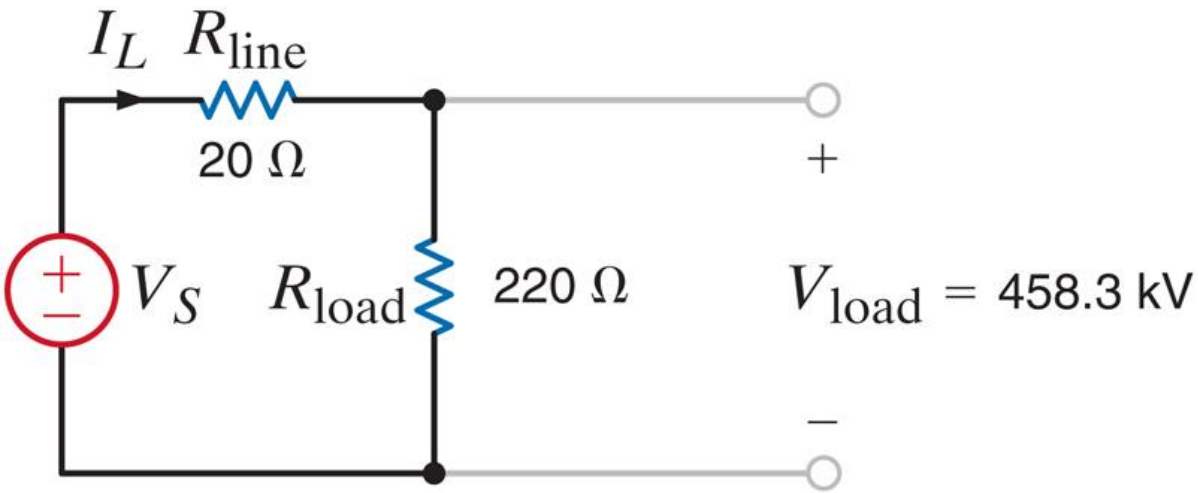
GERİLİM BÖLÜCÜ

$$V_o = \frac{R_2}{R_1 + R_2} V_S$$

" TERS " BÖLÜCÜ

$$V_S = \frac{R_1 + R_2}{R_2} V_o$$

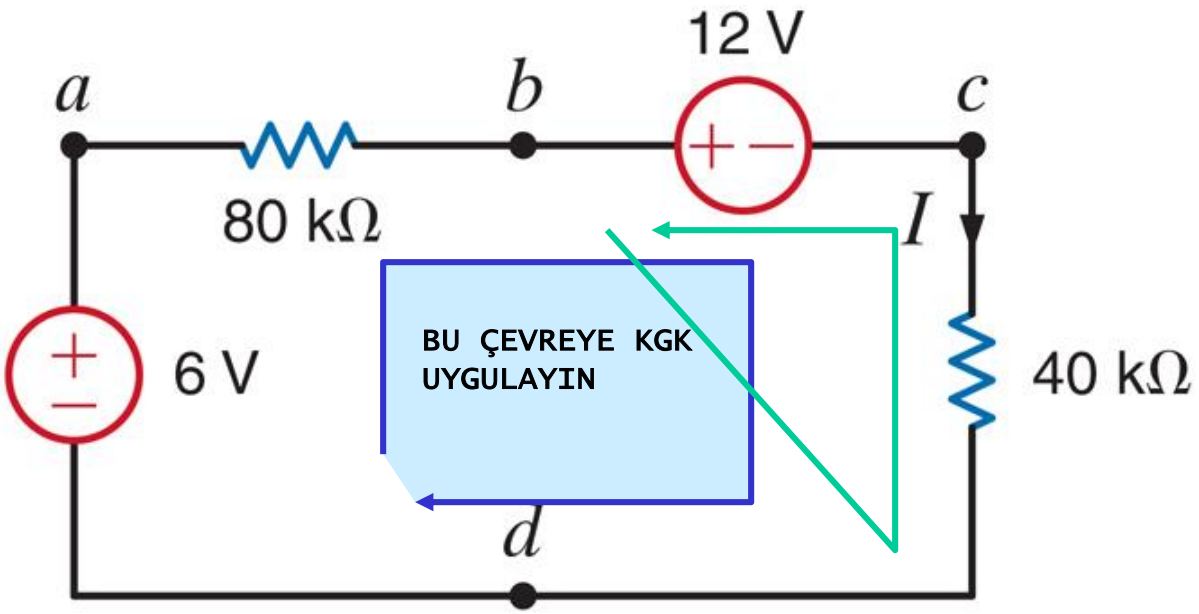
V_S'yi Hesaplayin



"TERS" BÖLÜCÜ

$$V_S = \frac{220 + 20}{220} 458.3 = 500 kV$$

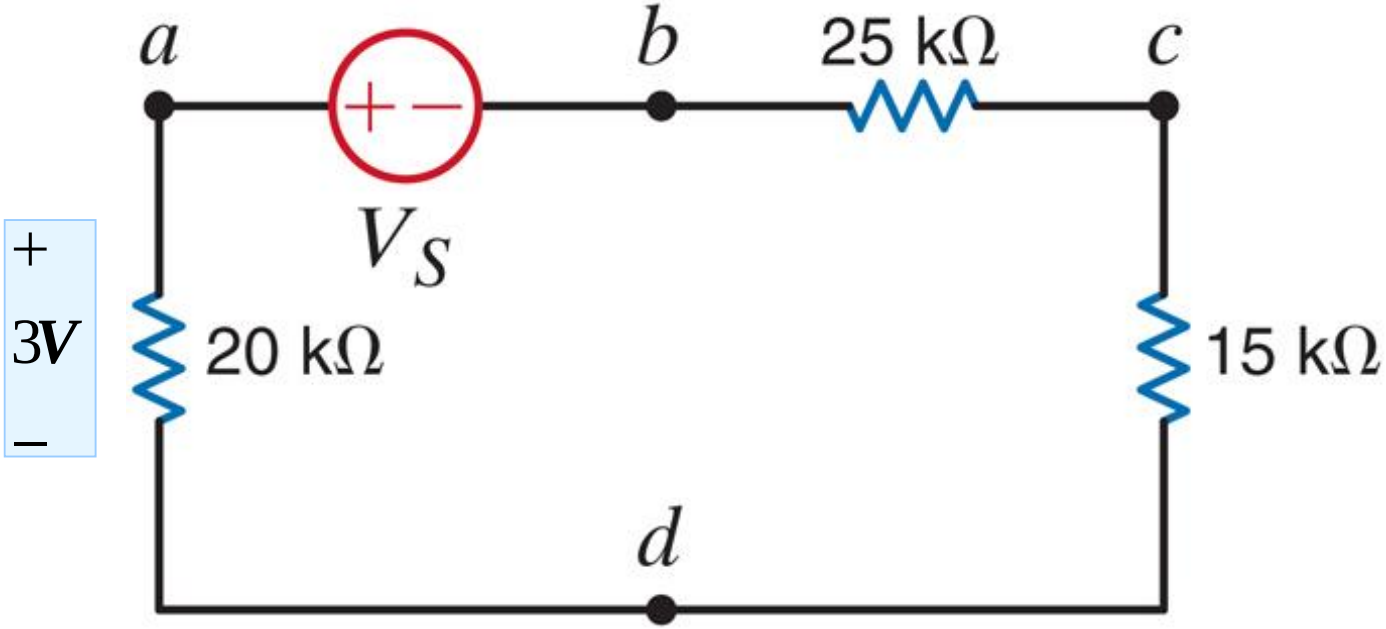
I ve V_{bd}'yi Bulun



$$-6+80kI+12+40kI=0 \Rightarrow I=-0.05mA$$

$$V_{bd}-40kI-12V=0 \Rightarrow V_{bd}=10V$$

Eğer V_{ad} = 3V ise, V_S'yi bulun



TERS BÖLÜCÜ PROBLEMİ

$$V_s = \frac{25+15+20}{20}3 = 9V$$

PROBLEM-SOLVING STRATEGY

SINGLE-LOOP CIRCUITS

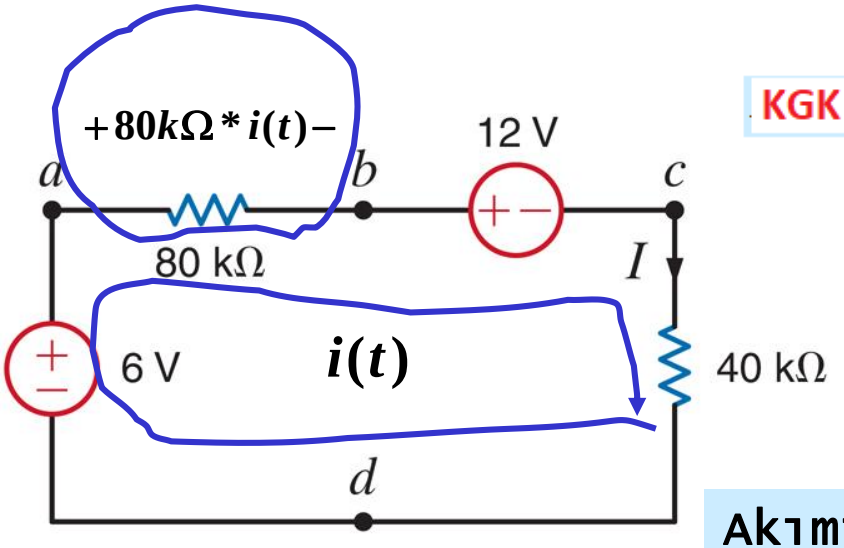
STEP 1. Define a current $i(t)$. We know from KCL that there is only one current for a single-loop circuit. This current is assumed to be flowing either clockwise or counterclockwise around the loop.

STEP 2. Using Ohm's law, define a voltage across each resistor in terms of the defined current.

STEP 3. Apply KVL to the single-loop circuit.

STEP 4. Solve the single KVL equation for the current $i(t)$. If $i(t)$ is positive, the current is flowing in the direction assumed; if not, then the current is actually flowing in the opposite direction.

Pasif işaret kuralının kullanımına dikkat edin



KGK : $-6V + 80k\Omega * i(t) + 12V + 40k\Omega * i(t) = 0$

$+$

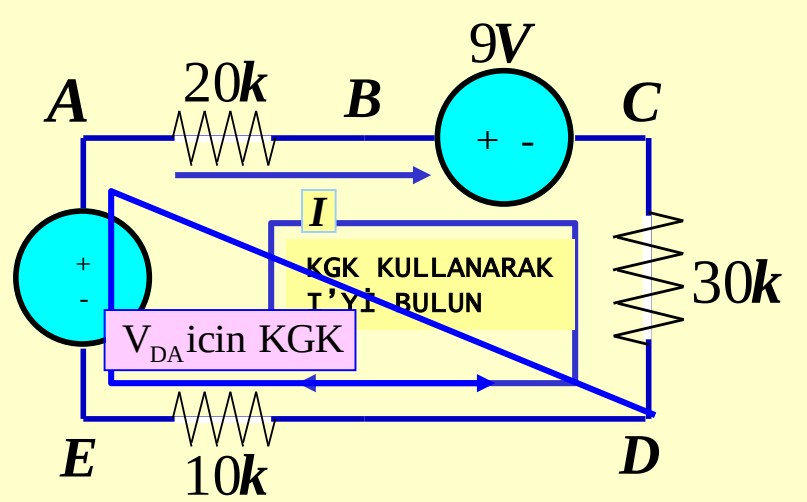
$40k\Omega * i(t)$

$-$

$$i(t) = -\frac{6V}{120k\Omega} = -0.05mA$$

Akımı bilmekle, kalan gerilim ve güçlerin TÜMÜ hesaplanabilir

ÖRNEK



$$V_{DA} =$$

$$V_{CD} = 30k * I = 1.5V$$

$$I_{DE} = 0.05mA$$

$$\text{KGK}: -12 + 20\text{k} * \text{I} + 9 + 30\text{k} * \text{I} + 10\text{k} * \text{I} = 0$$

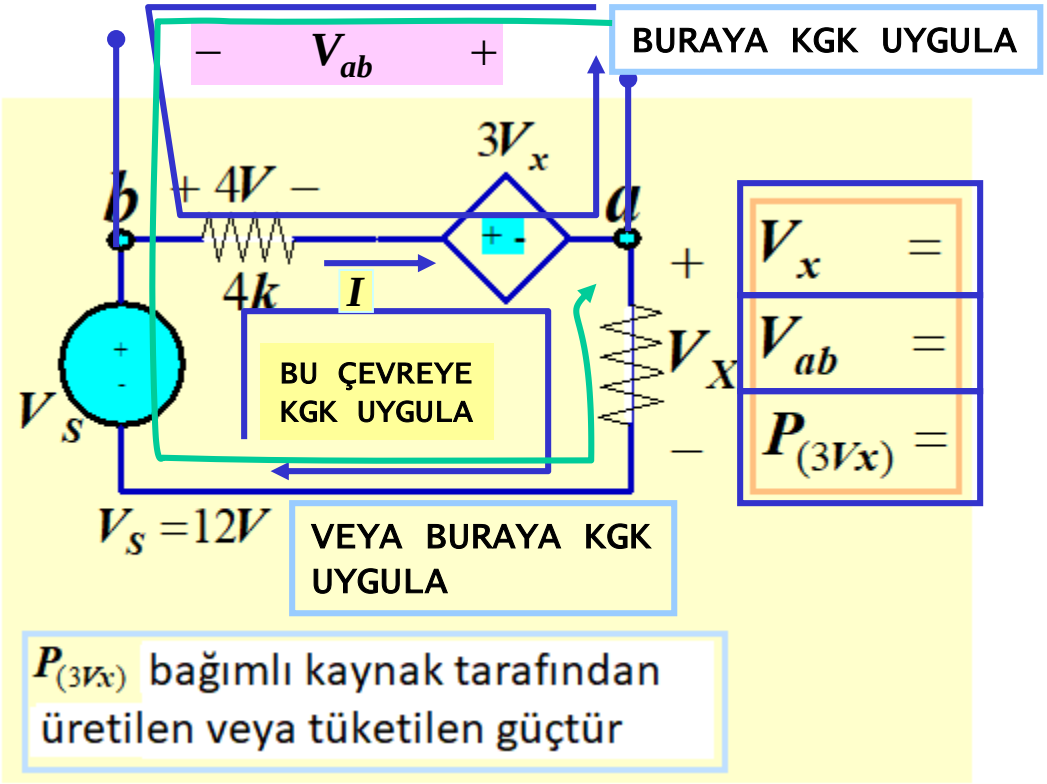
$$I = \frac{3V}{60k\Omega} = 0.05mA$$

$$\text{KGK}: V_{DA} + 12 - 10k * I = 0$$

$$V_{DA} = -11.5V$$

ÖRNEK

Bazen biraz değişiklik isteyebilirsiniz



$$\text{KGK}: \ -12+4+3V_X+V_X=0 \Rightarrow \qquad V_X = 2V$$

$$\text{KGK}: \ V_{ab}+4+3V_X=0 \Rightarrow \qquad V_{ab} = -10V$$

$$\text{KGK}: \ V_{ab}+V_S-V_X=0$$

$$P_{(3V_X)} = 3V_X I \ \ \text{(PASIF İSARETKURALI)}$$

$$\text{OHM KANUNU}: \ I = \frac{4V}{4k} = 1mA \qquad P_{(3V_X)} = 3[Vx]*1[mA] = 6mW$$