

T.C.
KÜTAHYA DÜMLUPINAR ÜNİVERSİTESİ
MÜHENDİSLİK FAKÜLTESİ
BİLGİSAYAR MÜHENDİSLİĞİ BÖLÜMÜ
ELEKTRONİK DERSİ YAZ OKULU ARA SINAVI

01.08.2022, Pazartesi

Saat: 11:00

Süre: 60 dakika

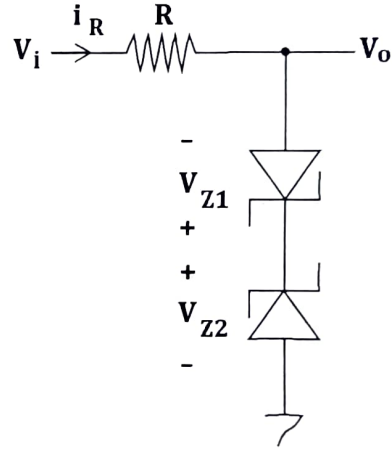
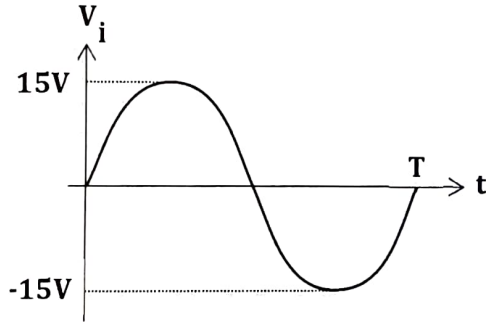
Not: Her bir soru 40 puandır.
Sorular öğrencide kalacaktır.

Soru 1

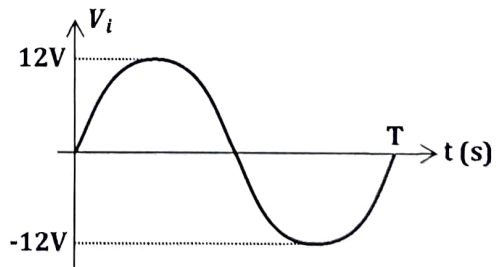
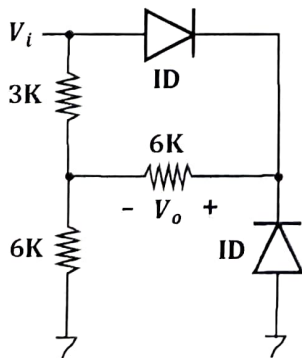
$V_{Z1} = 5.3 \text{ V}$, $V_{Z2} = 8.3 \text{ V}$, $R = 3 \text{ K}$, $v_T = 0.7 \text{ V}$ alınıyor.

Zener diyotların iç dirençleri 0 alınacak.

V_o ve i_R grafiklerini çiziniz.

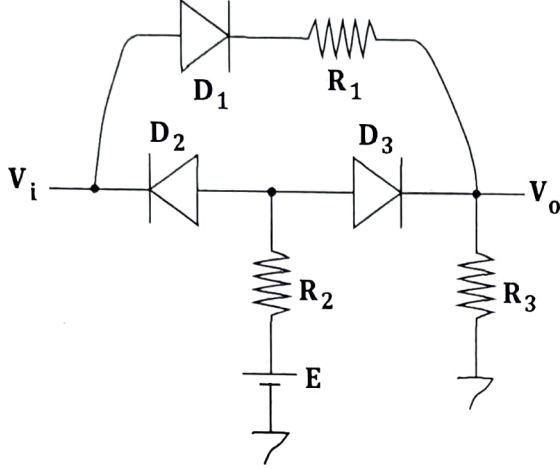


Soru 2



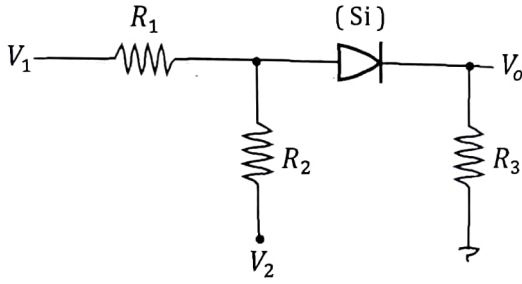
V_o grafiğini çiziniz ve $V_o(DC)$ değerini bulunuz.

Soru 3



$V_i = 15\text{ V}$, $E = 12\text{ V}$, $R_1 = 2\text{ K}$,
 $R_2 = 1.5\text{ K}$, $R_3 = 1.8\text{ K}$ alınıyor.
Diyotlar idealdir. Önce diyotları kapalı
farz edip durumlarını inceleyiniz.
Sonra $V_o = ?$

Soru 4



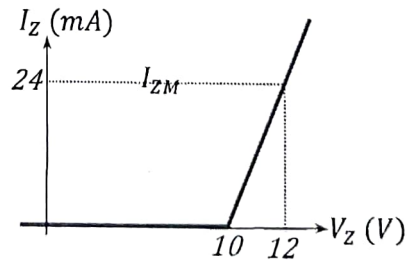
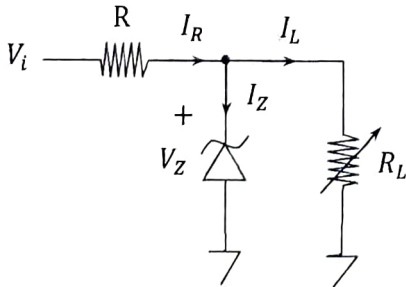
$V_1 = 30\text{ V}$, $V_2 = 10\text{ V}$, $R_1 = 2\text{ K}$,
 $R_2 = R_3 = 3\text{ K}$ alınsın. Si diyot için
 $V_T = 0.7\text{ V}$, $r_T = 60\ \Omega$ alınsın.
Önce Si diyotu kapalı farz edip
devreyi incele. Sonra i_d , V_d ve V_o
değerlerini bul.

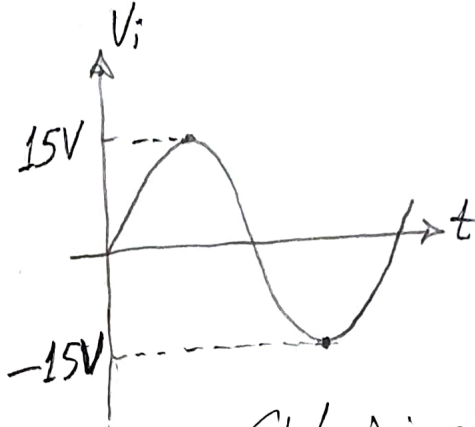
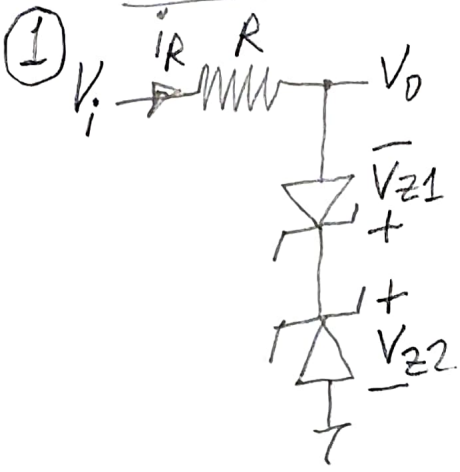
Soru 5

Zener diyot regülatör devresi için $R = 0.5\text{ K}$, $V_i = 20 + 5\sin(\omega t)$ alınıyor.

Zener diyotun tükettiği maksimum gücü bulunuz.

I_R , I_L , R_L aralıklarını bulunuz.





$$V_{z1} = 5.3V$$

$$V_{z2} = 8.3V$$

$$R = 3K$$

$$V_T = 0.7V \text{ alınıyor.}$$

V_o ve \dot{I}_R grafiklerini çiziniz.

Cevap 1

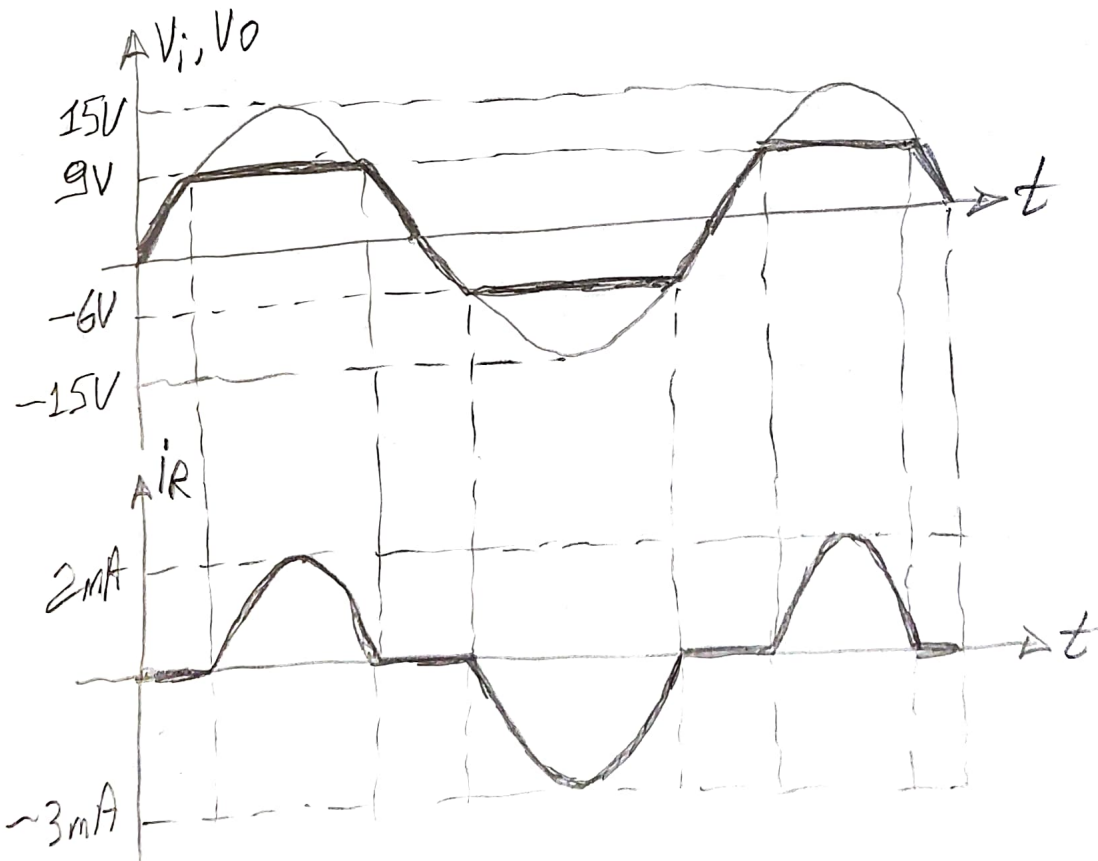
$$\dot{I}_R = 0 \text{ için } V_o = V_i$$

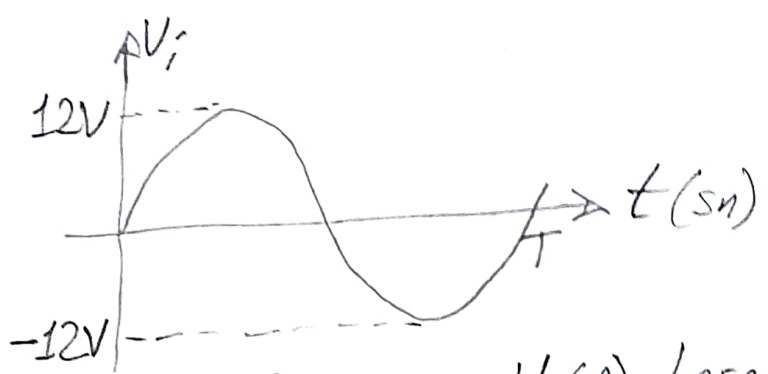
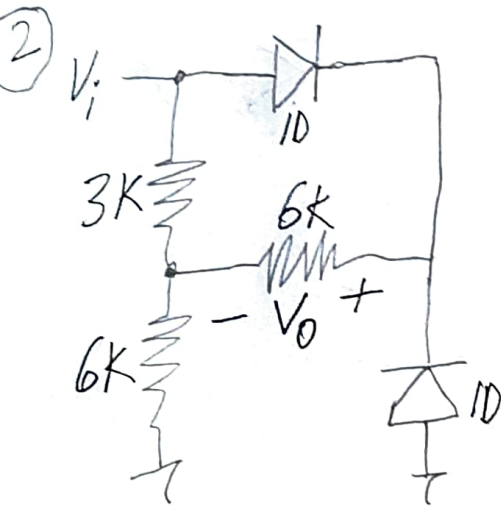
$$\dot{I}_R > 0 \text{ için } V_o = V_T + V_{z2} = 0.7V + 8.3V = 9V$$

$$\dot{I}_{Rmax} = \frac{V_{imax} - V_o}{R} = \frac{15V - 9V}{3K} = \frac{6V}{3K} = 2mA$$

$$\dot{I}_R < 0 \text{ için } V_o = -V_{z1} - V_T = -5.3V - 0.7V = -6V$$

$$\dot{I}_{Rmin} = \frac{V_{imin} - V_o}{R} = \frac{-15V - (-6V)}{3K} = -\frac{9V}{3K} = -3mA$$

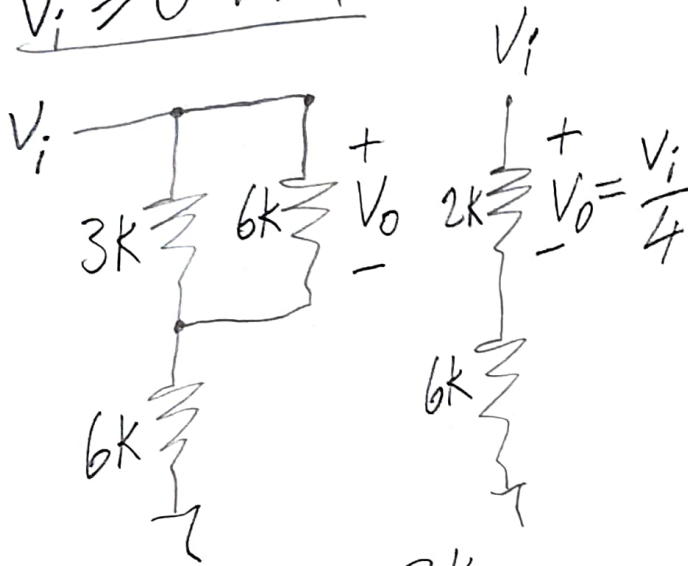




V_o grafiğini çiz. $V_o(D)$ hesapla

Cevap 2

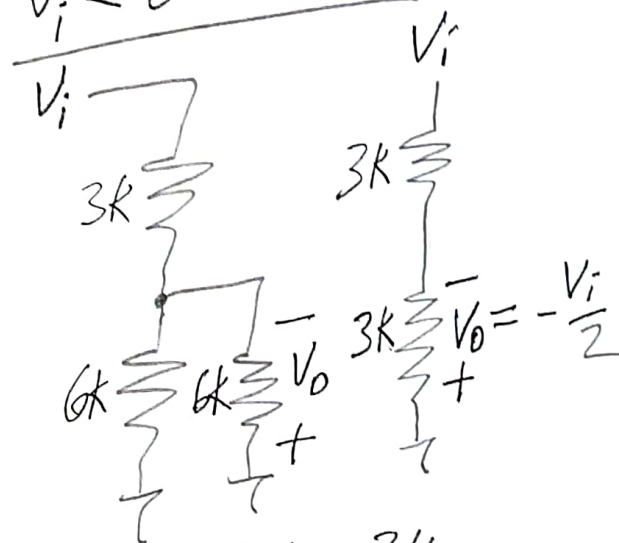
$V_i \geq 0$ iken



$$R_e = 3K // 6K = 2K$$

$$V_{o\max} = \frac{V_{i\max}}{4} = \frac{12V}{4} = 3V$$

$V_i < 0$ iken



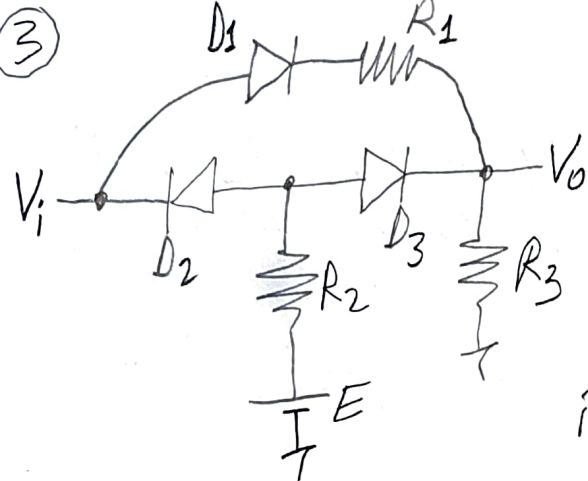
$$R_e = 6K // 6K = 3K$$

$$V_{o\max} = -\frac{V_{i\max}}{2} = +\frac{12V}{2} = 6V$$



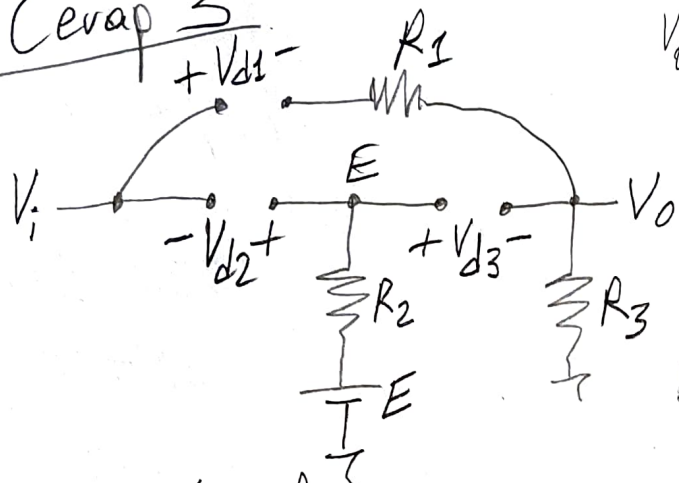
$$V_{DC} = 0.636 \times \left(\frac{3V + 6V}{2} \right) = 0.636 \times 4.5V$$

$$= 2.862V$$



$V_i = 15V, E = 12V$
 $R_1 = 2k, R_2 = 1.5k, R_3 = 1.8k$
 Diyotlar idealdir. Önce diyotları kapalı farzedip durumlarını incele. Sonra $V_o = ?$

Cevap 3

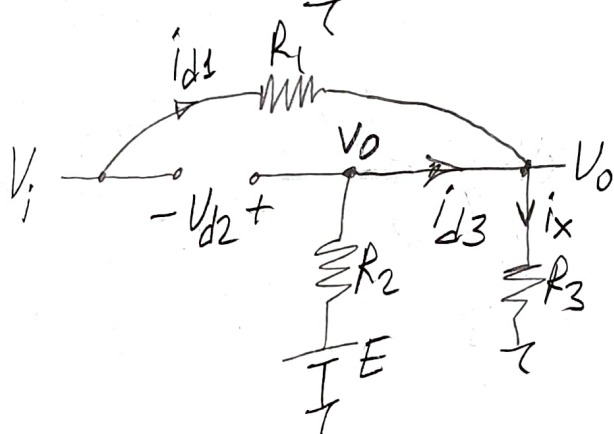


$V_o = 0 \text{ Volt}$

$V_{d1} = V_i - V_o = 15V \geq 0$ D_1 açık

$V_{d2} = E - V_i = 12V - 15V = -3V < 0$ D_2 kapalı

$V_{d3} = E - V_o = 12V \geq 0$ D_3 açık



$i_x = i_{d1} + i_{d3}$

$\frac{V_o}{R_3} = \frac{V_i - V_o}{R_1} + \frac{E - V_o}{R_2}$

$\frac{V_o}{1.8} = \frac{15 - V_o}{2} + \frac{12 - V_o}{1.5}$ 18 ile çarp

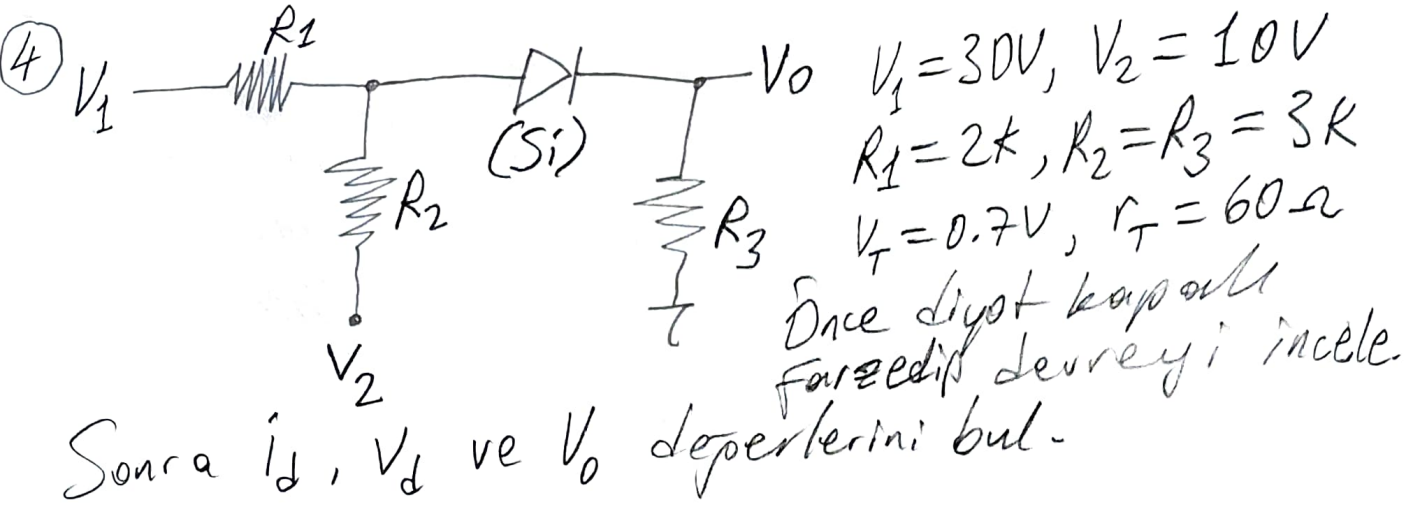
$10V_o = 135 - 9V_o + 144 - 12V_o \Rightarrow 31V_o = 279 \Rightarrow V_o = 9V$

$i_{d1} = \frac{V_i - V_o}{R_1} = \frac{15V - 9V}{2k} = \frac{6V}{2k} = 3mA \geq 0 \checkmark$

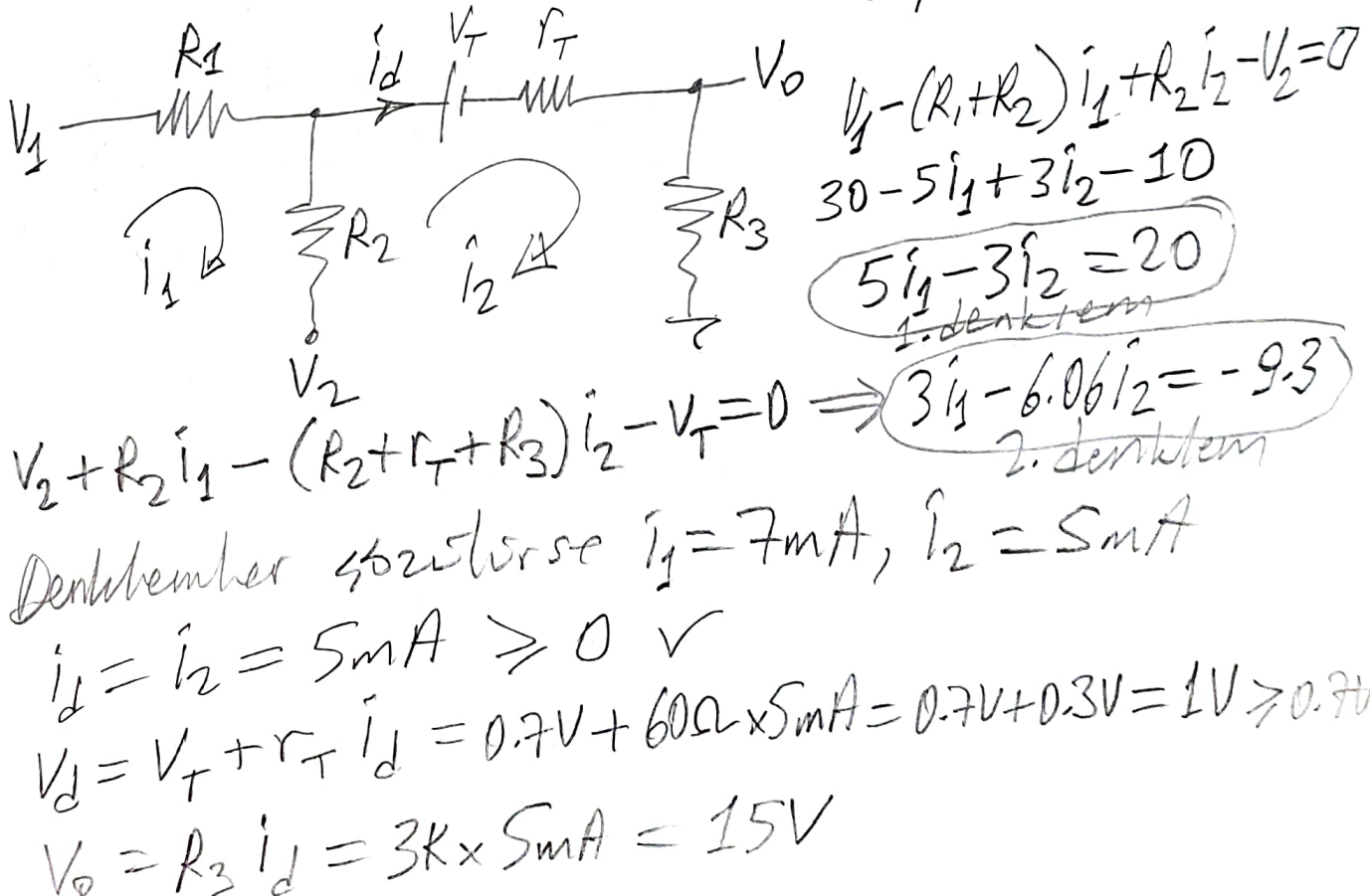
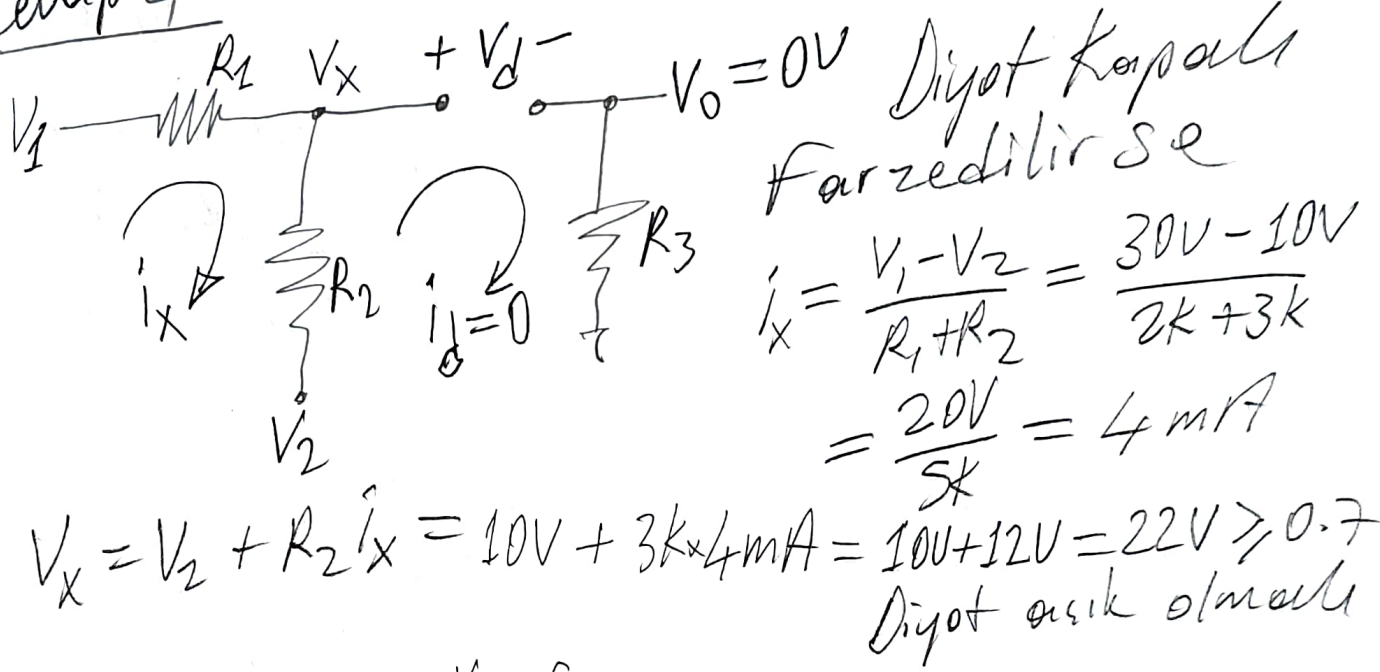
$V_{d2} = V_o - V_i = 9V - 15V = -6V < 0 \checkmark$

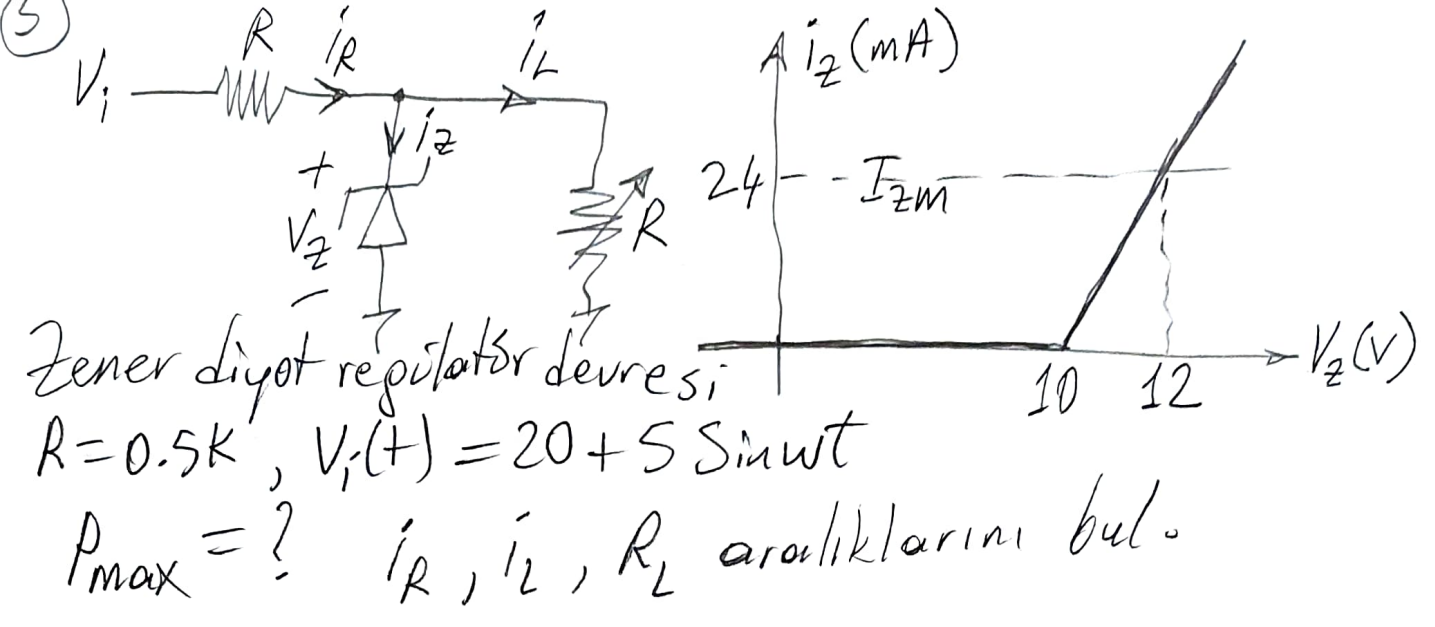
$i_{d3} = i_x - i_{d1} = \frac{V_o}{R_3} - i_{d1} = \frac{9V}{1.8k} - 3mA$

$= 5mA - 3mA = 2mA \geq 0 \checkmark$



Cevap 4





Cevap 5

$$P_{max} = V_{zmax} I_{zm} = 12V \times 24mA = 288mW = 0.288W$$

$$V_i(t) = 20 + 5 \sin \omega t \text{ için } V_{imin} = 15V, V_{imax} = 25V$$

$$i_{Rmin} = \frac{V_{imin} - V_{zmin}}{R} = \frac{15V - 10V}{0.5K} = \frac{5V}{0.5K} = 10mA$$

$$i_{Lmax} = i_{Rmin} = 10mA$$

$$R_{Lmin} = \frac{V_{zmin}}{i_{Lmax}} = \frac{10V}{10mA} = 1K$$

$$i_{Rmax} = \frac{V_{imax} - V_{zmax}}{R} = \frac{25V - 12V}{0.5K} = \frac{13V}{0.5K} = 26mA$$

$$i_{Lmin} = i_{Rmax} - I_{zm} = 26mA - 24mA = 2mA$$

$$R_{Lmax} = \frac{V_{zmax}}{i_{Lmin}} = \frac{12V}{2mA} = 6K$$

$$10mA \leq i_R \leq 26mA$$

$$2mA \leq i_L \leq 10mA$$

$$1K \leq R_L \leq 6K$$