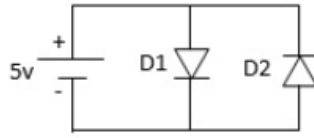


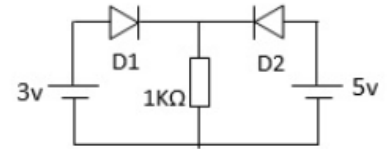


Exercise 1

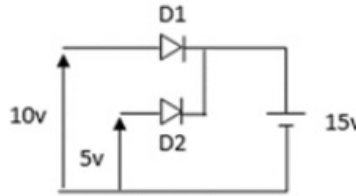
For each of the following circuits (Figure), determine the state of diodes **D₁** and **D₂**, assuming they are ideal.



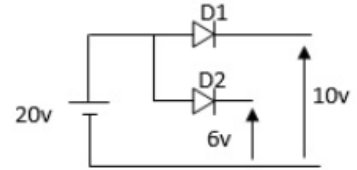
1



2



3

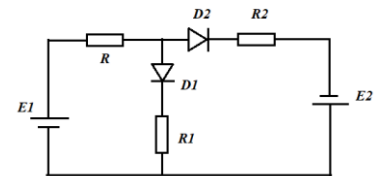


4

Exercise 2

Consider the electrical circuit shown in the figure. The diodes **D₁** and **D₂** are ideal.

Determine the state of diodes **D₁** and **D₂**, as well as the values of the currents **I₁** and **I₂**.

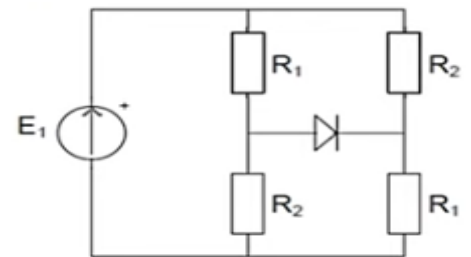


Exercise 3

Consider the circuit shown in the figure.

Given: $E_1 = +20\text{ V}$ or -20 V , $R_1 = 330\ \Omega$, $R_2 = 220\ \Omega$, $U_D = 0.7\text{ V}$,

- Determine the state of the diode (forward-biased or reverse-biased) for:
 - $E_1 = +20\text{ V}$
 - $E_1 = -20\text{ V}$
- For each case, calculate:
 - The voltage across the diode terminals.
 - The current flowing through the diode (if it conducts).
 - The currents through resistors **R₁** and **R₂**.
- Verify whether the assumption regarding the diode state is consistent with the calculated voltages.



Exercise 4

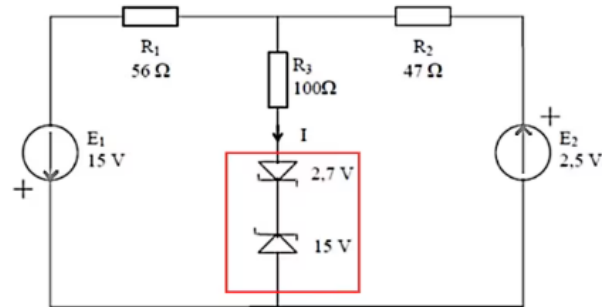
A silicon diode operates at temperature **T = 300 K**. Its characteristic is described by an exponential current–voltage law. Given:

- Saturation current: $I_s = 1 \times 10^{-12}\text{ A}$

- Thermal voltage: $V_T = 0,026 \text{ V}$
1. Calculate the diode current for a forward voltage $V=0.52 \text{ V}$.
 2. Determine the voltage required to obtain a current $I = 1 \text{ mA}$.
 3. Calculate the diode currents for:
 $V_1 = 0.52 \text{ V}$ and $V_2 = 0.572 \text{ V}$, then determine the ratio $I_2 \setminus I_1$.
 4. Calculate the diode current for a reverse voltage $V = - 0.26 \text{ V}$.
 5. Calculate the voltage corresponding to a current $I = 10 \text{ mA}$.

Exercise 5

Consider the electrical circuit shown in the figure.



The circuit contains two voltage sources: $E_1 = 15 \text{ V}$, $E_2 = 2.5 \text{ V}$ and three resistors: $R_1 = 56 \Omega$, $R_2 = 47 \Omega$, $R_3 = 100 \Omega$.

In the vertical branch, two zener diodes are connected in series but in opposite directions: Diode D_1 has a forward voltage drop of 2.7 V . Diode D_2 has a forward voltage drop of 15 V

1. Determine the state of diodes D_1 and D_2 (ON or OFF).
2. Calculate the current I flowing in the vertical branch (through D_1 and D_2).