

Name: \_\_\_\_\_

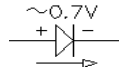
**ECE 2210 Homework DO1**

**Due: S, 11/11/23**

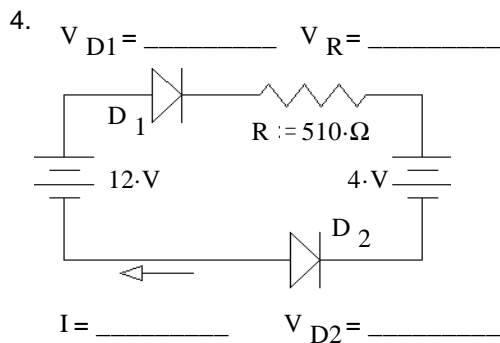
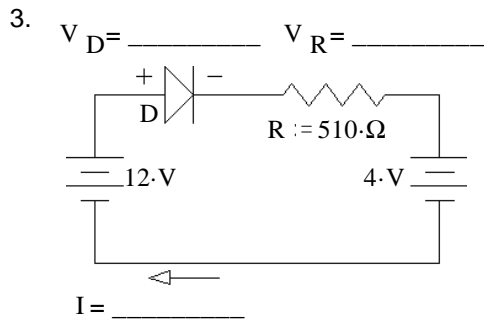
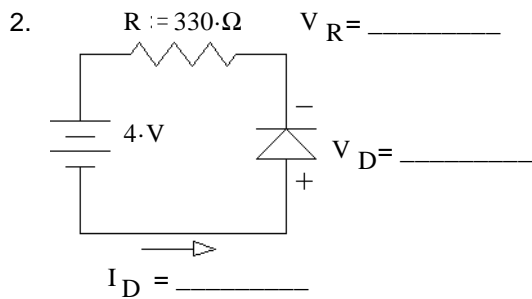
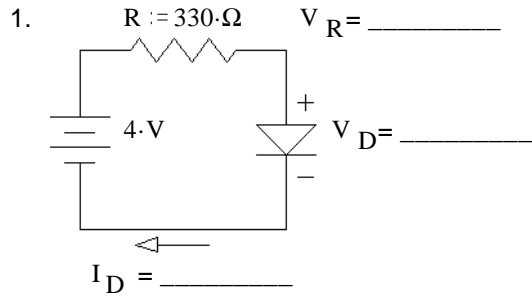
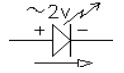
Fill in the blanks in the following circuits. For some of the simple calculations, you may simply write down the answer without showing work.

Assume the diodes are silicon with a 0.7V forward voltage drop:

A.Stolp rev c

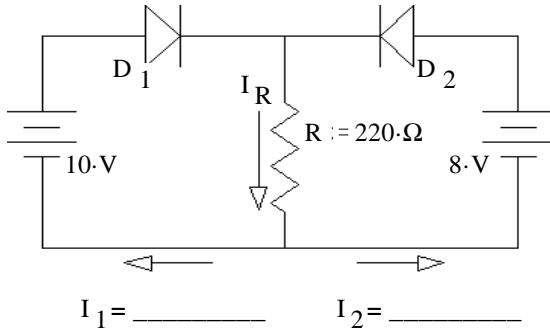


Assume the LEDs have a 2V forward voltage drop:



Note: In problems 5 and 6 you'll have to make some assumptions about which diode(s) is/are conducting. Work the problem with those assumptions and see if you arrive at impossible answers. If so, change your assumptions and try again.

5.  $V_{D1} = \underline{\hspace{2cm}}$      $V_{D2} = \underline{\hspace{2cm}}$

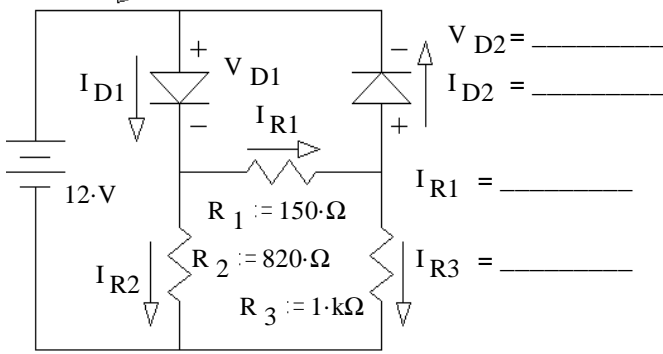


There are four possible assumptions.

1. Neither diode conducts.
2. Only  $D_1$  conducts.
3. Only  $D_2$  conducts.
4. Both diodes conduct.

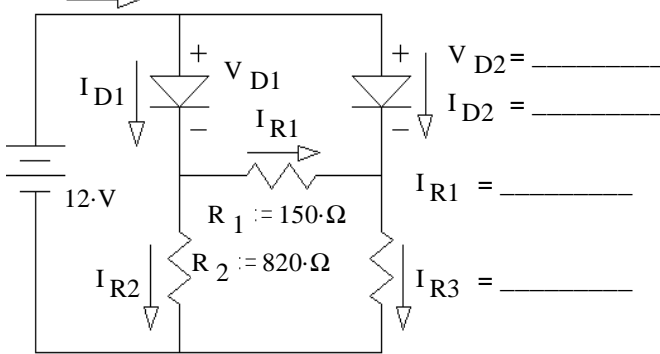
NOTE: You don't have to try all four possibilities. As soon as you find one that works, that's the answer. So make your best guess first.

6.  $I_T =$  \_\_\_\_\_  $V_{D1} =$  \_\_\_\_\_



$I_{R2} =$  \_\_\_\_\_

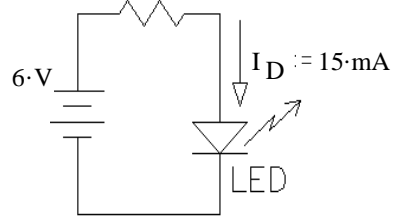
7.  $I_T =$  \_\_\_\_\_  $V_{D1} =$  \_\_\_\_\_



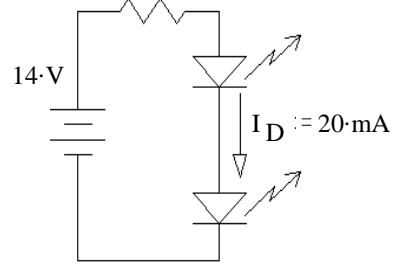
$I_{R2} =$  \_\_\_\_\_  $R_3 := 1\text{-k}\Omega$

8.  $V_R =$  \_\_\_\_\_

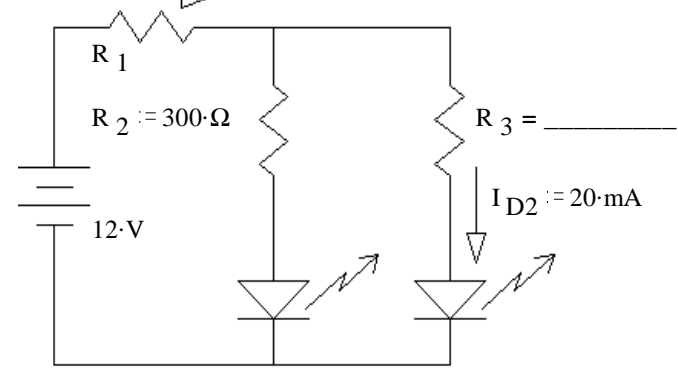
$R =$  \_\_\_\_\_



9.  $R =$  \_\_\_\_\_



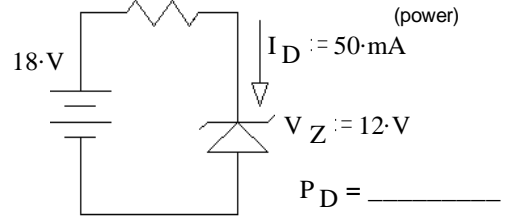
10.  $I_{R1} := 30\text{ mA}$        $R_1 =$  \_\_\_\_\_

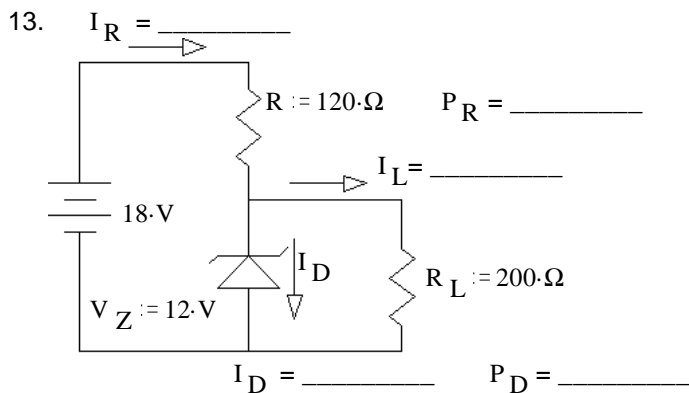
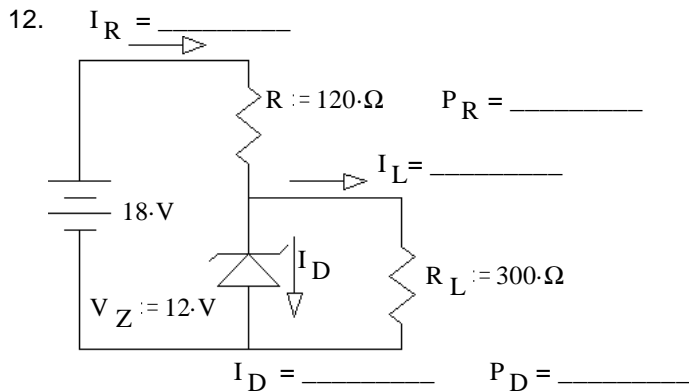


11.  $V_R =$  \_\_\_\_\_

$R =$  \_\_\_\_\_       $P_R =$  \_\_\_\_\_

(power)





Warning: If  $I_D$  turns out negative, it is actually 0 and you must recalculate everything else.

**Answers**

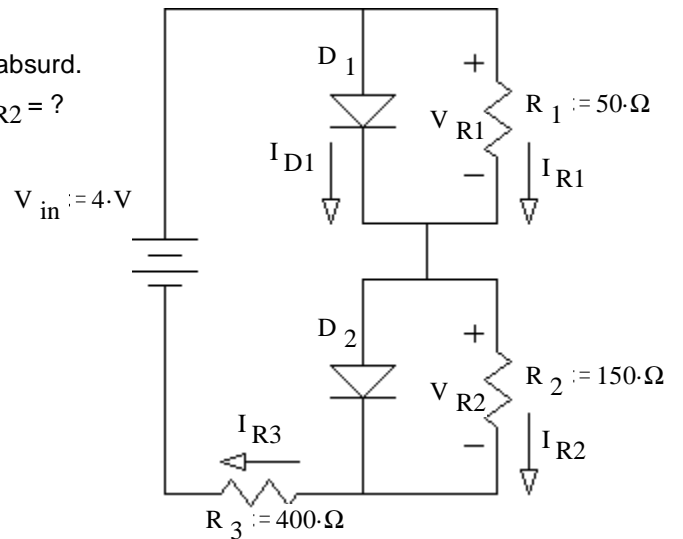
1.  $V_D := 0.7 \cdot V$      $V_R := 3.3 \cdot V$      $I_D := 10 \cdot mA$     2.  $I_D := 0 \cdot mA$      $V_D := -4 \cdot V$      $V_R := 0 \cdot V$
3.  $V_D := 0.7 \cdot V$      $V_R := 7.3 \cdot V$      $I := 14.3 \cdot mA$     4.  $I := 0 \cdot mA$      $V_{D2} := -8 \cdot V$      $V_{D1} := 0 \cdot V$      $V_R := 0 \cdot V$
5.  $V_{D1} := 0.7 \cdot V$      $V_{D2} := -1.3 \cdot V$      $I_1 := 42.3 \cdot mA$      $I_2 := 0 \cdot mA$
6.  $I_{D2} := 0 \cdot mA$      $V_{D1} := 0.7 \cdot V$      $I_{R2} := 13.8 \cdot mA$      $I_{R1} = I_{R3} := 9.83 \cdot mA$      $V_{D2} := -2.17 \cdot V$      $I_{D1} = I_T := 23.6 \cdot mA$
7.  $V_{D1} := 0.7 \cdot V$      $V_{D2} := 0.7 \cdot V$      $I_{R1} := 0 \cdot mA$      $I_{R2} := 13.8 \cdot mA = I_{D1}$      $I_{R3} := 11.3 \cdot mA = I_{D2}$      $I_T := 25.1 \cdot mA$
8.  $V_R := 4 \cdot V$      $R := 267 \cdot \Omega$     9.  $R := 500 \cdot \Omega$     10.  $R_1 := 233 \cdot \Omega$      $R_3 := 150 \cdot \Omega$
11.  $V_R := 6 \cdot V$      $I_D := 50 \cdot mA$      $R := 120 \cdot \Omega$      $P_R := 0.3 \cdot W$      $P_D := 0.6 \cdot W$
12.  $I_L := 40 \cdot mA$      $I_R := 50 \cdot mA$      $I_D := 10 \cdot mA$      $P_R := 0.3 \cdot W$      $P_D := 0.12 \cdot W$
13.  $I_D := 0 \cdot mA$      $I_L = I_R := 56.3 \cdot mA$      $V_L := 11.3 \cdot V$      $P_R := 0.38 \cdot W$      $P_D := 0 \cdot W$
14. a)  $V_{R1} := 0.7 \cdot V$      $I_{R1} := 14 \cdot mA$      $I_{R3} := 6 \cdot mA$      $I_{D1} := -8 \cdot mA$      $V_{R2} := 0.9 \cdot V$     b) no  $I_{D1} := -8 \cdot mA < 0$
- c) no  $V_{D2} = V_{R2} = 0.9 \cdot V > 0.7 \cdot V$     15. a)  $I_{R2} := 30 \cdot mA$      $I_{D2} := -4 \cdot mA$      $I_{D1} := 26 \cdot mA$      $V_{D3} := 0.92 \cdot V$
- b) yes  $I_{D1} := 26 \cdot mA > 0$     c) no  $I_{D2} := -4 \cdot mA < 0$
- d) no  $V_{D3} := 0.92 \cdot V > 0.7 \cdot V$     e) ii)    **ECE 2210 homework DO1 p5    Two More Pages ----->**

14. Assume that diode  $D_1$  does conduct. Assume that diode  $D_2$  does NOT conduct.

a) Find  $V_{R1}$ ,  $I_{R1}$ ,  $I_{R3}$ ,  $I_{D1}$ ,  $V_{R2}$  based on these assumptions.

Stick with these assumptions even if your answers come out absurd.

$V_{R1} = ?$        $I_{R1} = ?$        $I_{R3} = ?$        $I_{D1} = ?$        $V_{R2} = ?$



b) Was the assumption about  $D_1$  correct? yes or no

How do you know? (Specifically show a value which is or is not within a correct range.)

c) Was the assumption about  $D_2$  correct? yes or no

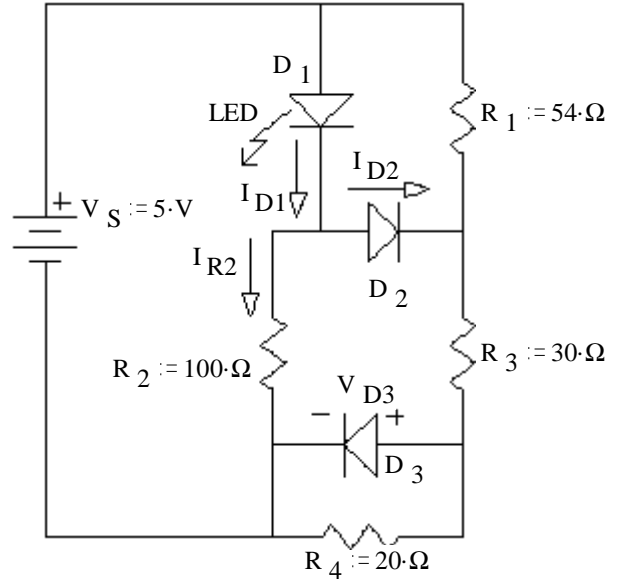
How do you know?

15. Assume that diodes  $D_1$  and  $D_2$  **DO** conduct.

Assume that diode  $D_3$  does **NOT** conduct.

a) Find  $I_{R_2}$ ,  $I_{D_2}$ ,  $I_{D_1}$ , &  $V_{D_3}$  based on these assumptions. Stick with these assumptions even if your answers come out absurd.

$I_{R_2} = ? \quad I_{D_2} = ? \quad I_{D_1} = ? \quad V_{D_3} = ?$



- b) Based on the numbers above, was the assumption about  $D_1$  correct?    yes     no  
 How do you know? (Show a value & range.)
- c) Was the assumption about  $D_2$  correct?    yes    no     d) Was the assumption about  $D_3$  correct?    yes    no  
 How do you know? (Show a value & range.)     How do you know? (Show a value & range.)
- e) Based on your answers to parts b), c) & e):    You do not need to justify your answer.
- i) The **real**  $I_{R_2} < I_{R_2}$  calculated in part a.
  - ii) The **real**  $I_{R_2} = I_{R_2}$  calculated in part a.
  - iii) The **real**  $I_{R_2} > I_{R_2}$  calculated in part a.