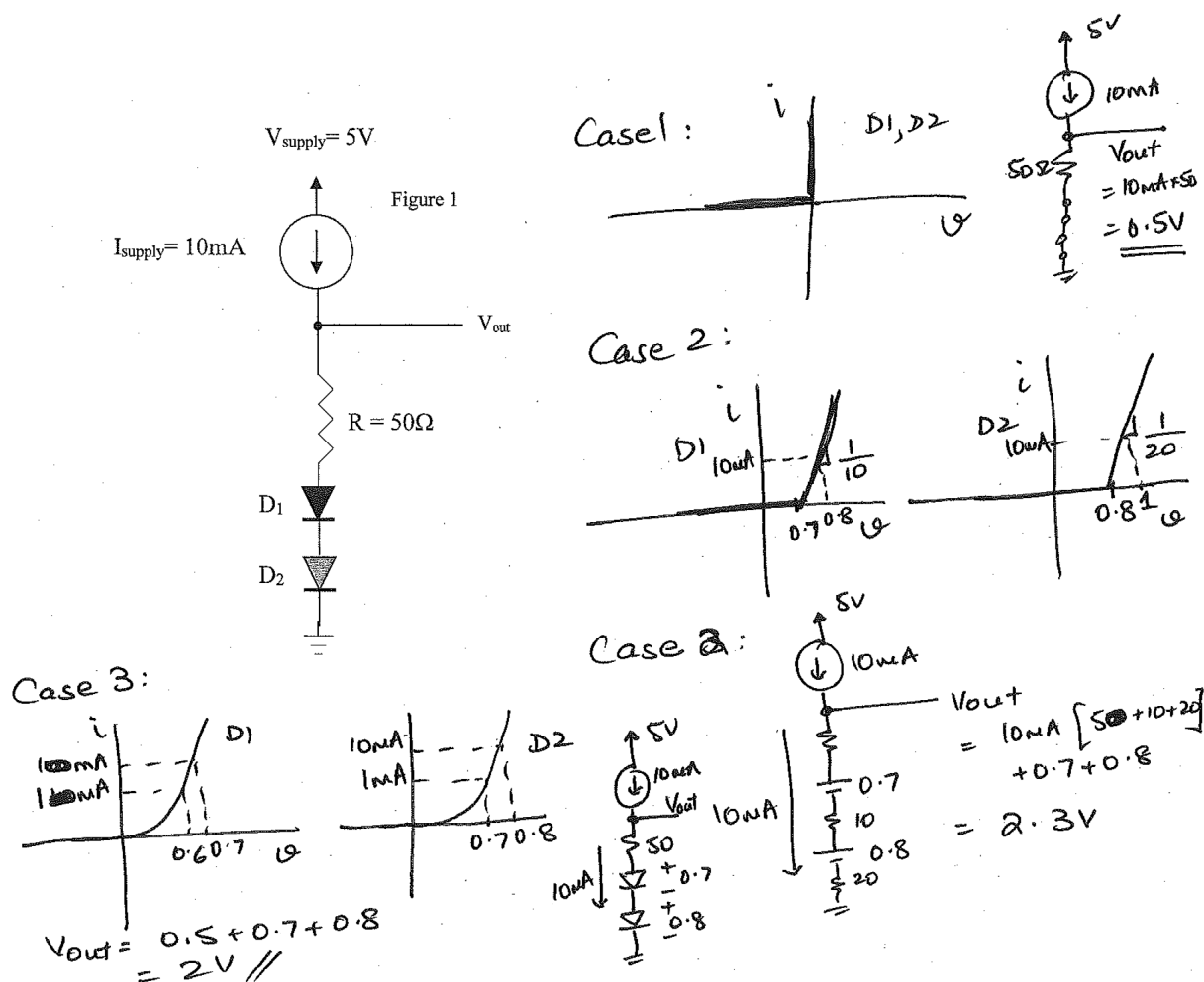


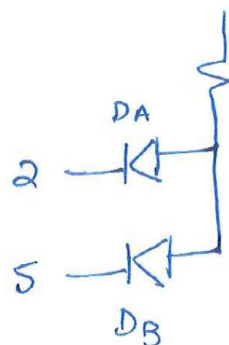
SANTA CLARA UNIVERSITY	ELEN 115 – Spring 2023	S. Krishnan
Homework #5 Solutions		

1.

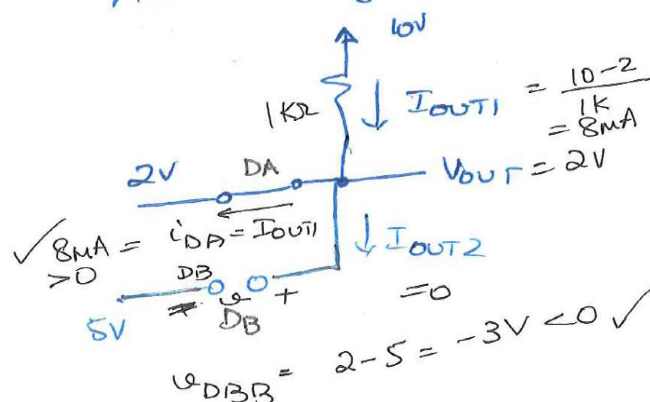


2.

2. Case A

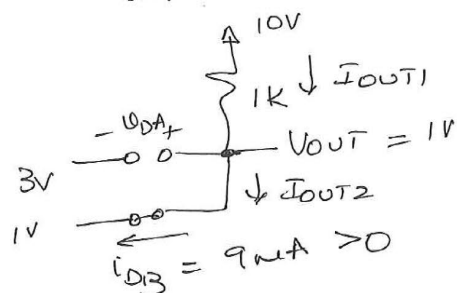


Assume  $D_A$  ON  $\Rightarrow$  Prove  $i_{DA} > 0$   
 Assume  $D_B$  OFF  $\Rightarrow$  Prove  $v_{DB} < 0$



Case B

$D_A$  — OFF  $D_B$  — ON



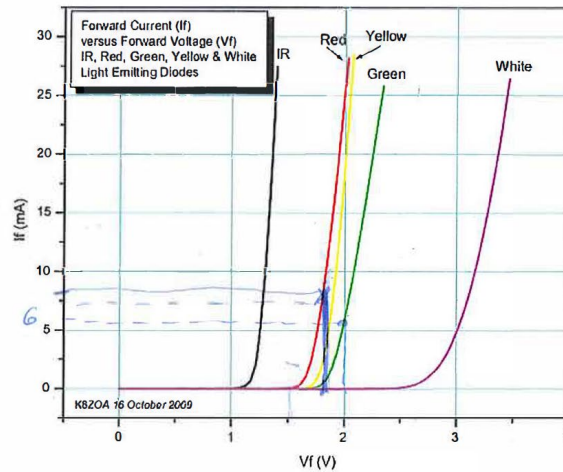
CASE 3

$D_A$  — OFF  $D_B$  ON  
 $v_{DB} = 0-1 = -1V < 0 \checkmark$

$$I_{OUT1} = I_{OUT2} = \frac{10-0}{1K} = 10mA = i_{DB} > 0$$

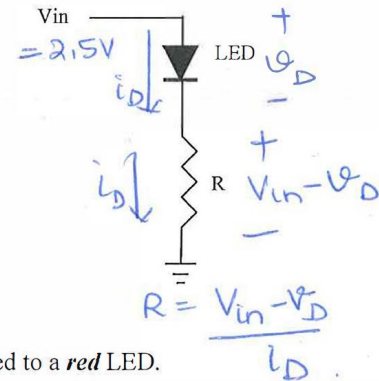
(b) Diode with the lowest cathode voltage is ON when the anodes of these diodes are tied together.

3.



LED Color	Forward Voltage
Red	1.63 ~ 2.03V
Yellow	1.72 ~ 2.18V
Green	1.82 ~ 2.35V
White	2.75 ~ 3.45V

Figure 1(c)



- Design the circuit (find R) to light up the **green** LED.
- Using the value for R you found in (a), the LED is switched to a **red** LED.  
Will the LED be brighter? Explain why or why not.
- Can the **white** LED be used in the circuit? Explain why or why not.

$$(a) R = \frac{2.5 - 2}{6 \text{ mA}} = \frac{0.5}{6 \text{ mA}} = 83.33 \Omega$$

$$(b) \frac{2.5 - V_D}{83.33} = I_D \quad V_D = 2.5 - I_D \times 83.33 \quad \leftarrow \text{one possible point}$$

$$1.8 = 2.5 - 8 \text{ mA} \times 83.33$$

As  $V_D$  for RED LED  $< V_D$  for GREEN  
 $\Rightarrow V_R$  higher  $\Rightarrow R$  higher  $\Rightarrow$  LED brighter

(c) White LED needs at least 2.65V to turn on  
 $\Rightarrow V_{in} = 2.5$  Not enough to turn LED on  
 So cannot use white LED.