EE100 Discussion

Q:)

$i_o = ?$

Circuit analysis

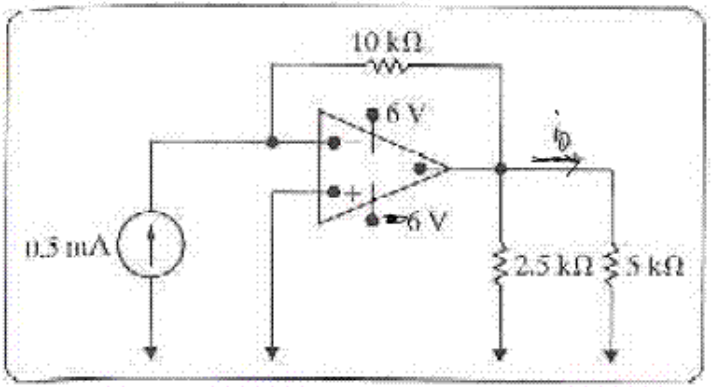
$i_o \neq 0$!

eg: From Op-amp review.

5.3 Find i_o in the circuit in Fig. P5.3 if the op amp is ideal.

P

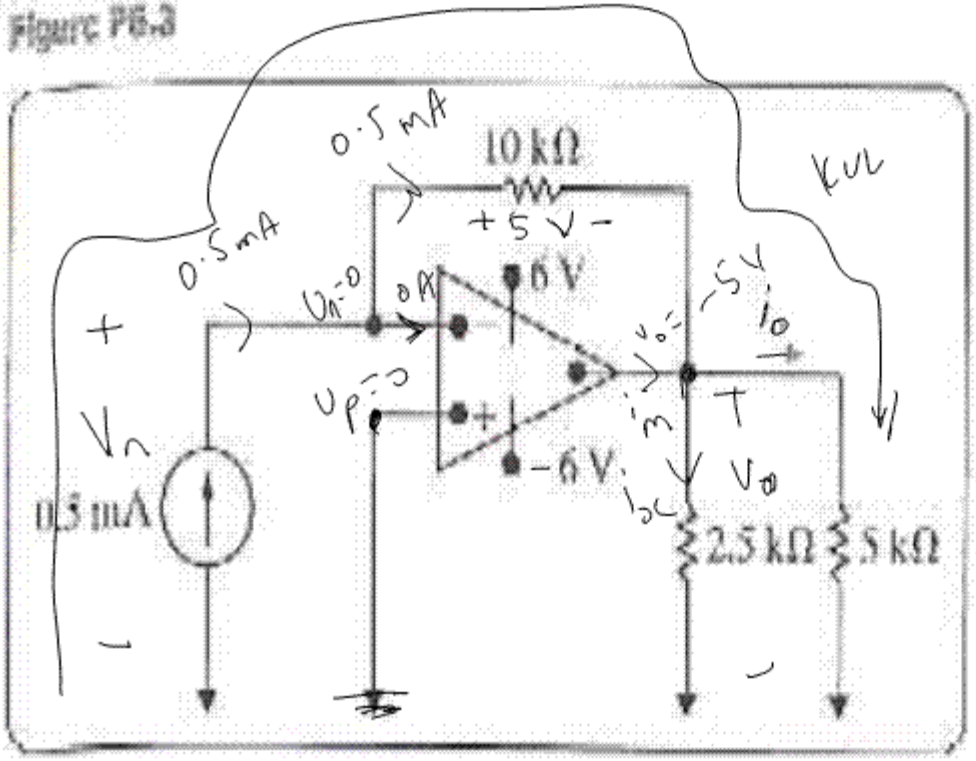
Figure P5.3



5.3 Find i_o in the circuit in Fig. P5.3 if the op amp is ideal.

P

Figure P5.3



Assume $v_p \simeq v_n$

[Do Not ignore rail voltage]

KVL: $V_1 + (-5\,V) + (-V_o) = 0 \Rightarrow v_o = -5\,V \quad (v_n = 0)$

Since $-5 > -6 \Rightarrow$ op-amp does not rail.

$$i_o = \frac{-5V}{5k} = -1\,mA$$

Boxes: What's i_m? KCL @ v_o: $0.5\,mA + i_m = i_o + i_{2k}$

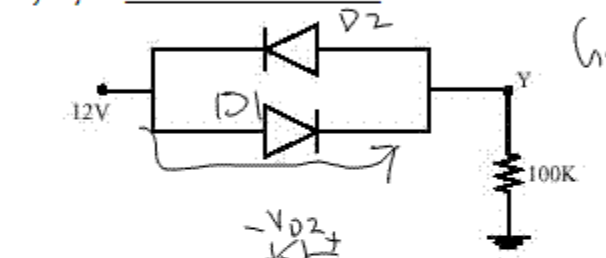
$$\Rightarrow \quad i_m = -1mA + (-0.5\,mA) + \left(\frac{-5}{2.5k}\right)$$

$$= -1\,mA + -0.5\,mA + -2\,mA$$

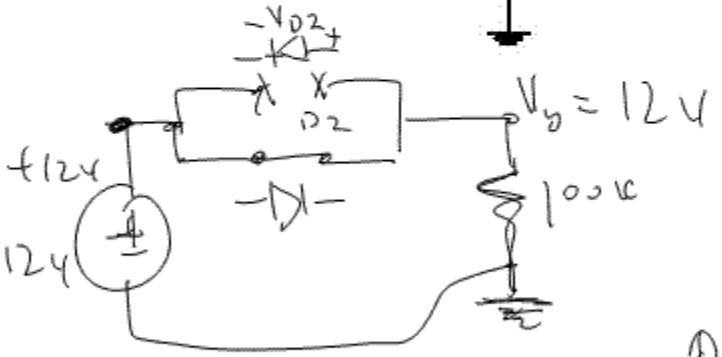
$$\boxed{i_m = -3.5\,mA}$$

(2) Diodes (From EE40 Fall 99, MT 2, HKN Online Exams website (http://hkn.eecs))

b) Vy = 12 V

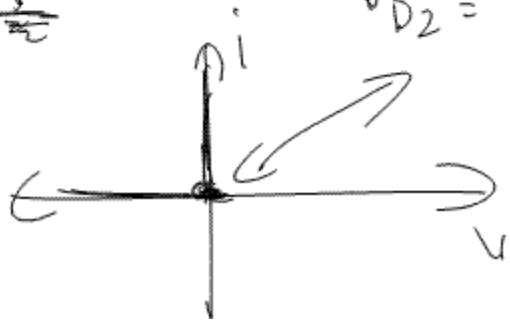


Guess: D1 on, D2 off → current from 12V flows left to right

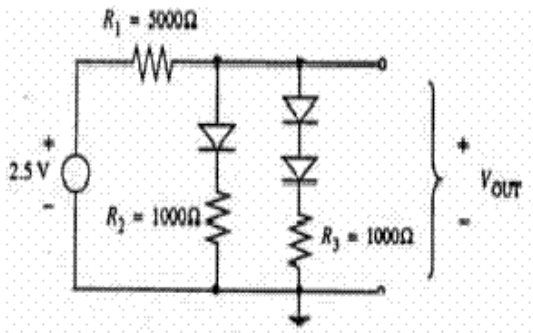


(Q:) Is D2 off?

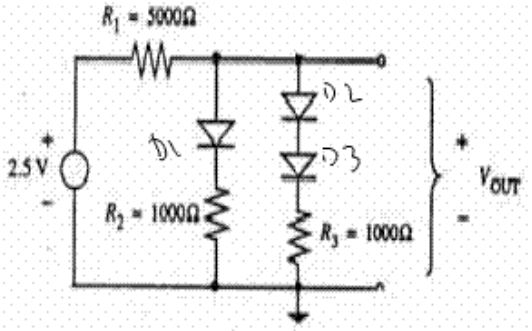
$V_{D2} = 0$ V



(3) EE40, MT #2, Sp. 98.



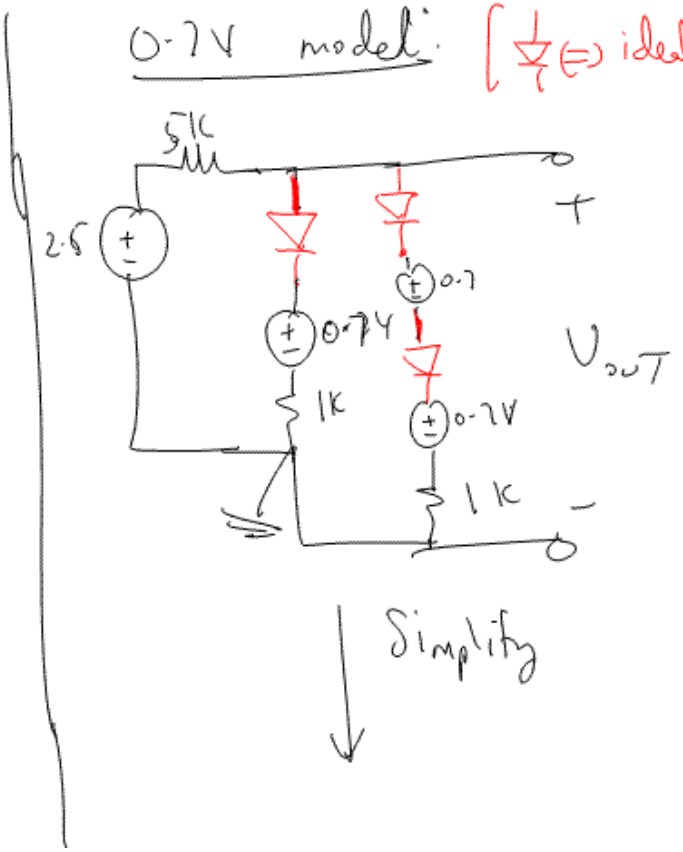
IDEAL



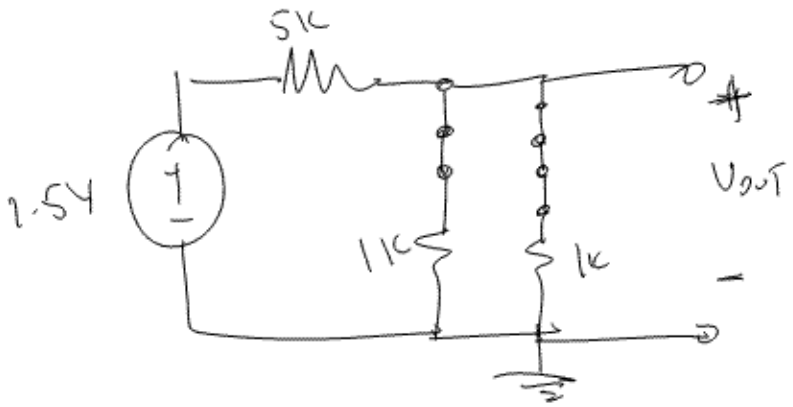
Guess: All diodes are on → because of current flow

(2.) Find V_{OUT}. Lets use the ideal diode model & 0.7V model.

0.7V model: [ideal diode]

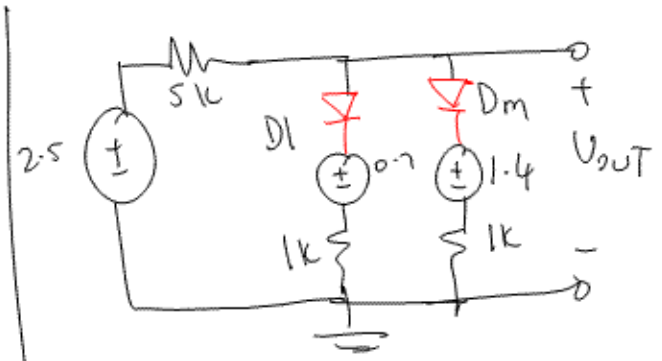


2.5V source!



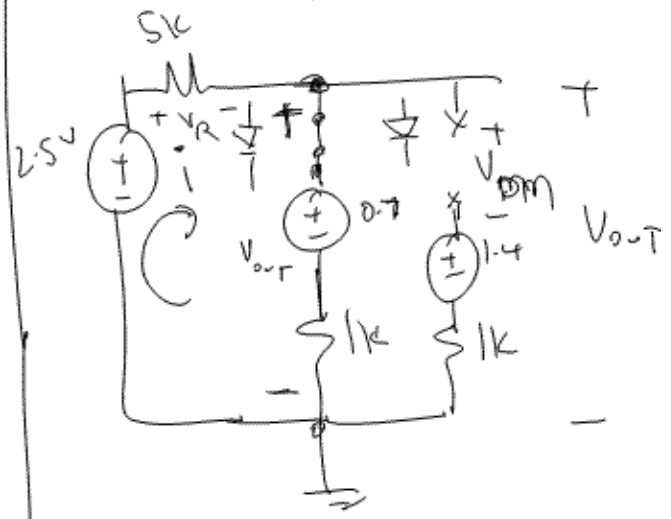
$$V_{OUT} = \left(\frac{500\Omega}{500+500}\right) 2.5 \quad \left[\begin{array}{l} 1k \| 1k, \\ \text{voltage} \\ \text{divider} \end{array}\right]$$

$$= \frac{500}{1000} 2.5 = \frac{2.5}{11} \approx 0.23\,V$$



Assume D1 on,

Dm off



KVL around loop 1:

$2.5 - i(5k) - 0.7 - i(1k) = 0$

$\Rightarrow \quad i = \frac{2.5 - 0.7}{6k} = \frac{1.8\,V}{6k} = 0.3\,mA$

$\therefore \quad 2.5 - V_{out} = V_R \Rightarrow V_{out} = 2.5 - (0.3\,mA)(5k)$

$$\boxed{V_{out} = 1.0\,V}$$

$V_{DM} = V_{out} - 1.4\,V = -0.4 < 0$ ✓