14.03.2007
Wednesday

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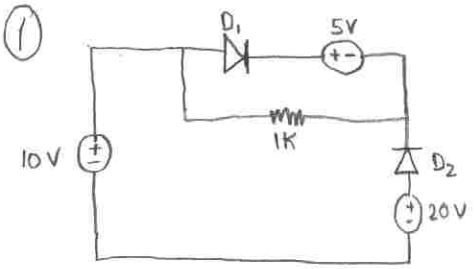
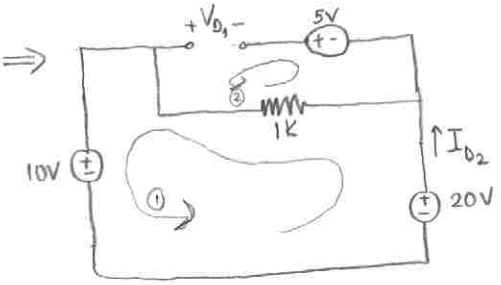
EE 282
HW#1

(1)



Assume D_1 is OFF and D_2 is ON:



at loop ① by KVL → $-20 + 10^3 I_{D_2} + 10 = 0$

$I_{D_2} = 10\ mA$

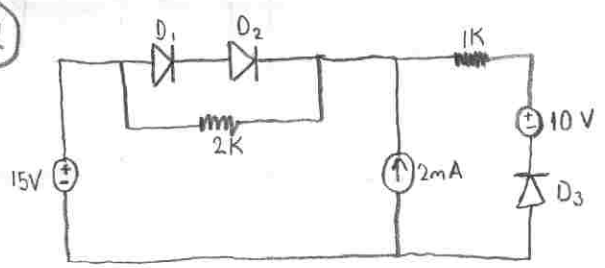
at loop ② by KVL → $-5 - V_{D_1} - 10^3 10^{-2} = 0$

$V_{D_1} = -15\ V$

Since $I_{D_2} = 10mA > 0$ and $V_{D_1} = -15V < 0$, the assumption is true.

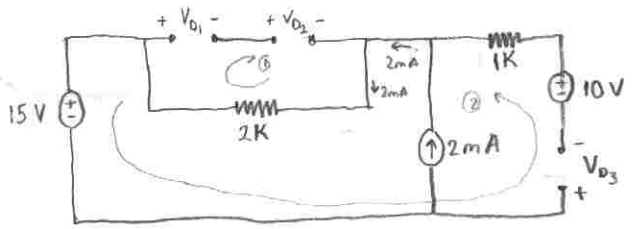
Therefore D_1 is OFF and D_2 is ON.

(2)



D_1 and D_2 are both on or off. (since if one of them on and the other is off then there will no current and assumption will be wrong.)

Assume D_1, D_2 and D_3 are all OFF:



KVL at loop ① → $4V + V_{D_1} + V_{D_2} = 0$

$V_{D_1} + V_{D_2} = -4V$

KVL at loop ② → $15 + V_{D_3} - 10 \underbrace{-V_{D_1} - V_{D_2}}_{+4V} = 0$

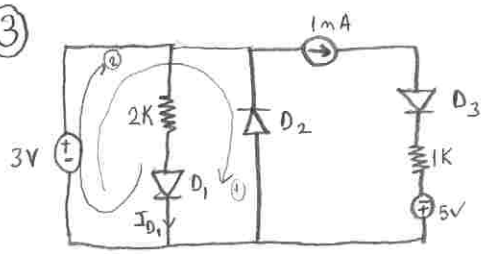
$15 + V_{D_3} - 10 + 4 = 0$

$V_{D_3} = -9V$

Since $V_{D_1} < 0$, $V_{D_2} < 0$, $V_{D_3} < 0$, the assumption is true.

Therefore D_1, D_2 and D_3 are all OFF.

(3)



D_3 is on because of the current source.

Assume D_1 and D_3 are ON, D_2 is OFF:

KVL at loop ①: $-3 - V_{D_2} = 0$

$V_{D_2} = -3V$

KVL at loop ②: $-3 + 2.10^3 I_{D_1} + 1 = 0$

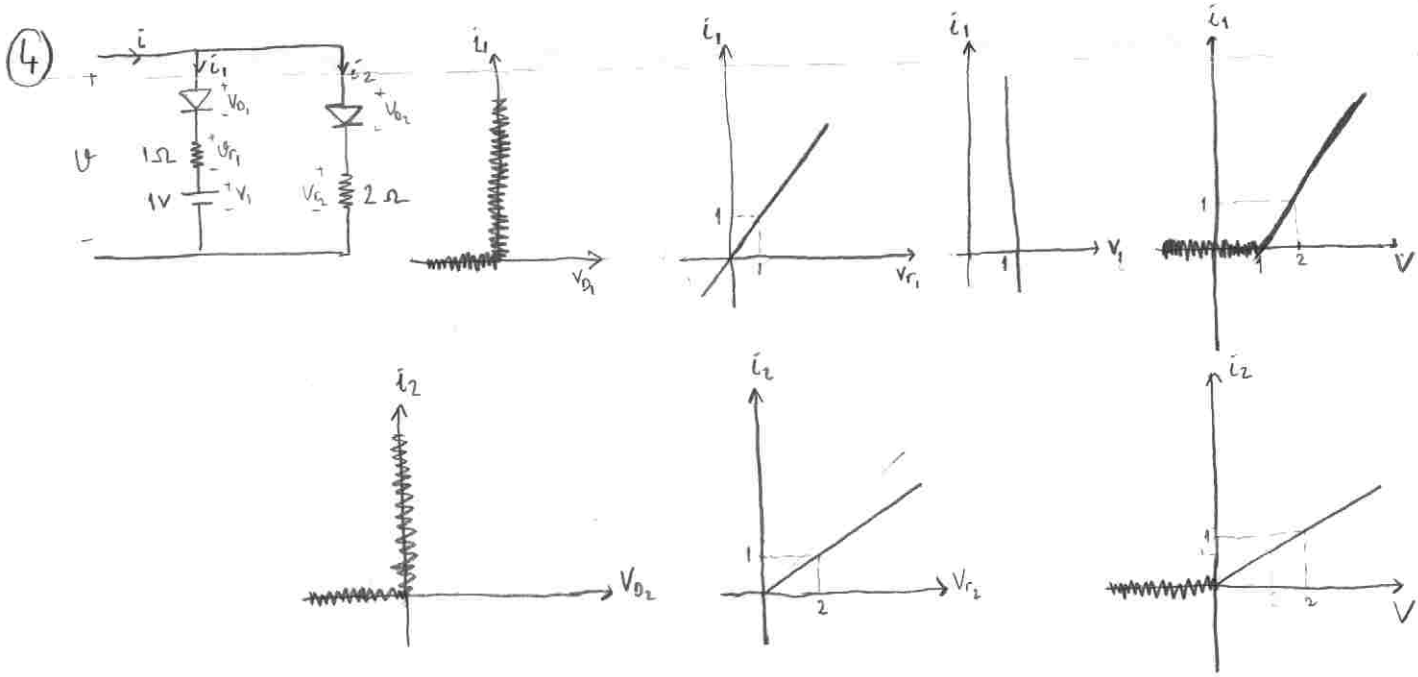
$I_{D_1} = 1mA$

$I_{D_3} = 1mA$

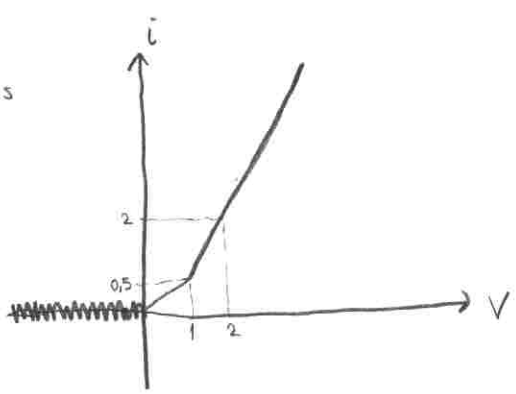
Since $V_{D_2} = -3V < 1V$, $I_{D_1} > 1mA$, $I_{D_3} > 1mA$, the assumption is true.

Therefore D_1 and D_3 are ON, D_2 is OFF.

(4)

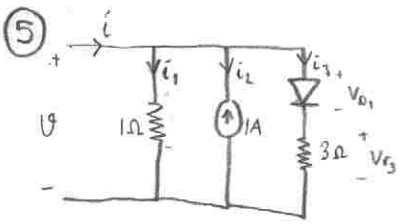


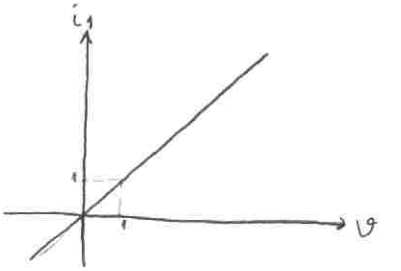
So the i-V characteristic is

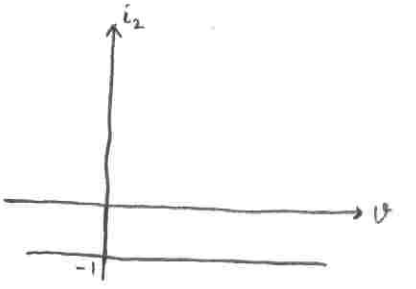


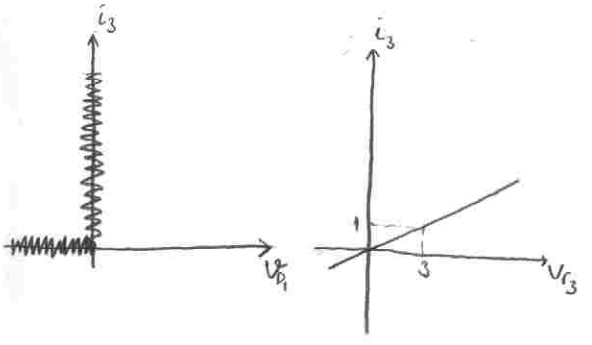
(III)

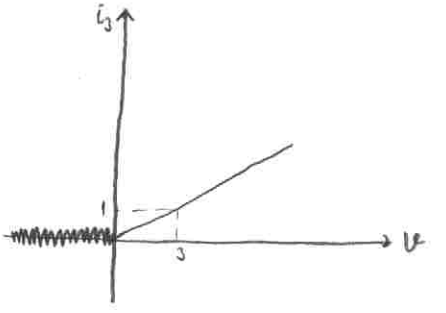
(5)











So the i-v characteristic is