

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

Student ID #: \_\_\_\_\_

**EECS 170A Section B  
Homework #3**

HW will be collected in DISCUSSION ONLY.

Do not turn your HW in anywhere else, or it will not be accepted.

You are encouraged to turn it in at your own discussion section.

You may turn it in at any discussion section.

Last option to turn in: Right after Wednesday discussion section November 2, 2005.

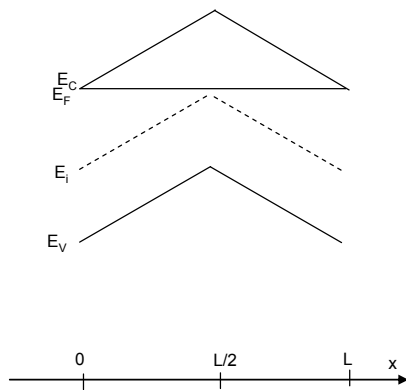
DUE: 1 PM Wednesday, November 2, 2005.

Please *staple* this sheet to the front of your homework.

1a	1b	1c	1d	2a	2b	2c	2d	3a	3b	3c	3d	4a	4b	4c	4d	43	Total
/5	/5	/5	/10	/5	/5	/5	/10	/5	/5	/5	/10	/5	/5	/5	/5	/5	/100

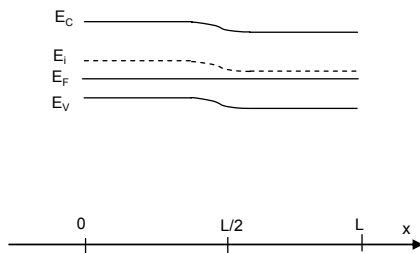
1) Answer a-d for the figure shown below:

- Do equilibrium conditions prevail? How do you know?
- Sketch the electrostatic potential ( $V$ ) inside the semiconductor as a function of  $x$ .
- Sketch the electric field ( $\mathcal{E}$ ) inside the semiconductor as a function of  $x$ .
- Roughly sketch  $n$  and  $p$  versus  $x$ .



2) Answer a-d for the figure shown below:

- Do equilibrium conditions prevail? How do you know?
- Sketch the electrostatic potential ( $V$ ) inside the semiconductor as a function of  $x$ .
- Sketch the electric field ( $\mathcal{E}$ ) inside the semiconductor as a function of  $x$ .
- Roughly sketch  $n$  and  $p$  versus  $x$ .



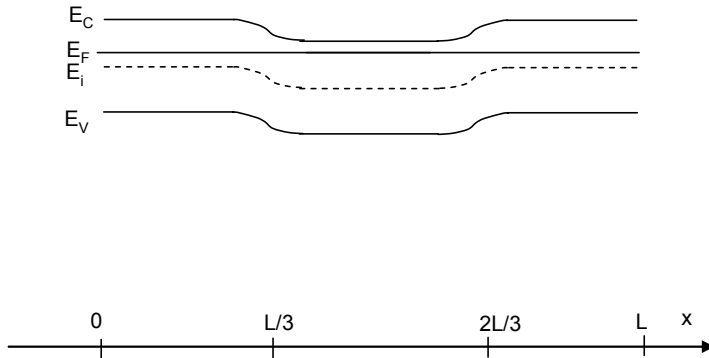
3) Answer a-d for the figure shown below:

- Do equilibrium conditions prevail? How do you know?

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- Sketch the electrostatic potential ( $V$ ) inside the semiconductor as a function of  $x$ .
- Sketch the electric field ( $\mathcal{E}$ ) inside the semiconductor as a function of  $x$
- Roughly sketch  $n$  and  $p$  versus  $x$ .



(CORRECTED FIGURE)

- 4) For Si at 300 K, calculate  $E_C - E_F$  and sketch  $E_C$ ,  $E_F$ ,  $E_i$ , and  $E_V$  as in figure 2.18 of the book for the following cases:
- $N_D = 10^{17} \text{ cm}^{-3}$ ;  $N_A \ll N_D$ .
  - $N_D = 10^{18} \text{ cm}^{-3}$ ;  $N_A \ll N_D$ .
  - $N_A = 10^{19} \text{ cm}^{-3}$ ;  $N_D \ll N_A$ .
  - $N_A = 10^{15} \text{ cm}^{-3}$ ;  $N_D \ll N_A$ .
  - $N_A = N_D = 10^{11} \text{ cm}^{-3}$ .