Name:_____

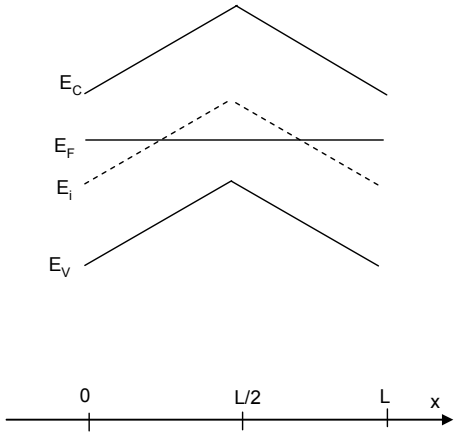
Student ID #:_____

**EECS 170A Section B**
**Homework #3**
**DUE: Wednesday Discussion section, November 7, 2007.**

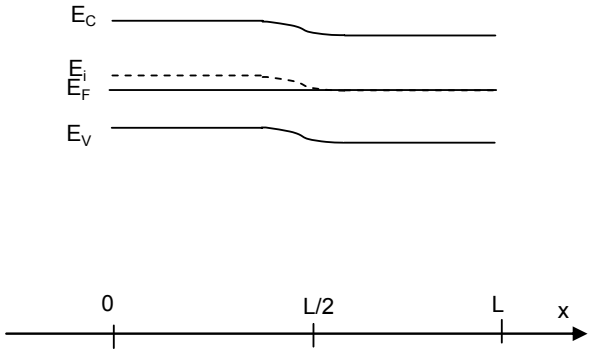
Please *staple* this sheet to the front of your homework.

| 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:
   a. Do equilibrium conditions prevail? How do you know?
   b. Sketch the electrostatic potential (V) inside the semiconductor as a function of x.
   c. Sketch the electric field (E) inside the semiconductor as a function of x
   d. Roughly sketch n and p versus x.



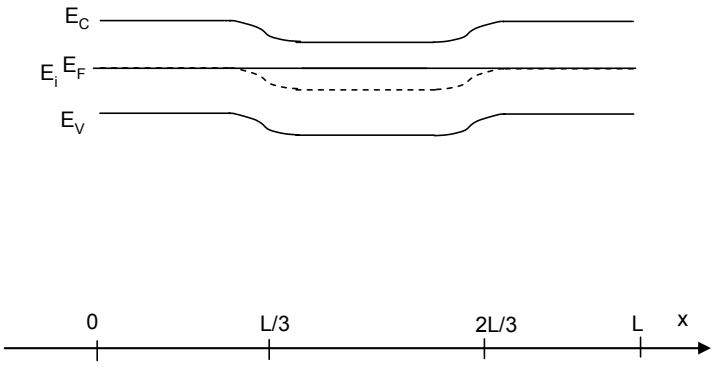

2) Answer a-d for the figure shown below:
   a. Do equilibrium conditions prevail? How do you know?
   b. Sketch the electrostatic potential (V) inside the semiconductor as a function of x.
   c. Sketch the electric field (E) inside the semiconductor as a function of x
   d. Roughly sketch n and p versus x.



Name:_____

Student ID #:_____

3) Answer a-d for the figure shown below:
   a. Do equilibrium conditions prevail? How do you know?
   b. Sketch the electrostatic potential (V) inside the semiconductor as a function of x.
   c. Sketch the electric field (E) inside the semiconductor as a function of x
   d. Roughly sketch n and p versus x.




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:

a. $N_D = 10^{18}$ cm$^{-3}$; $N_A = 10^{12}$ cm$^{-3}$.
b. $N_A = 10^{18}$ cm$^{-3}$; $N_D = 10^{12}$ cm$^{-3}$.
c. $N_A = 10^{18}$ cm$^{-3}$; $N_D = 10^{18}$ cm$^{-3}$.
d. $N_A = 10^{12}$ cm$^{-3}$; $N_D = 10^{12}$ cm$^{-3}$.
e. $N_A = 10^{18}$ cm$^{-3}$. $N_D = 10^{11}$ cm$^{-3}$