Name:_____

Student ID #:_____

EECS 170A
Homework #4

HW will be collected in discussion section.
Please do not turn your HW in anywhere else.
Due: Noon Thursday, October 27, 2011.

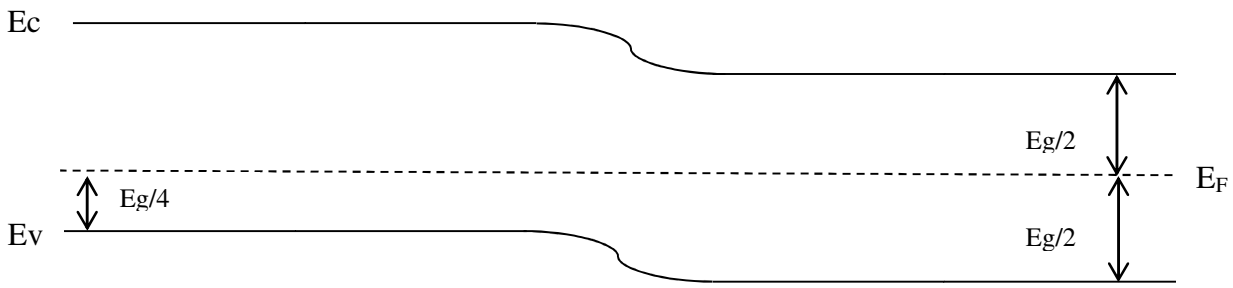
Please *staple* this sheet to the front of your homework.

1	2	3	4	Total
/25	/25	/25	/25	/100

1) Given Si at room temperature at equilibrium. $N_D = 0$, $N_A(x) = 10^{16}$ cm^{-3} for $x < 0$ and $N_A(x) = 10^{17}$ cm^{-3} for $x > 1\mu m$ with a smooth gradual variation in between.

   a) Sketch and find: Hole Concentration p(x), Electron Concentration n(x), Electric Field E(x), $J_{ndiff}(x)$, $J_{ndrift}(x)$, $J_{pdiff}(x)$, $J_{pdrift}(x)$.
   b) Sketch the Band Diagram.
   c) Which current components are the largest? Which are the smallest?

2) Given the following Band Diagram:



   a) Sketch and find: Hole Concentration p(x), Electron Concentration n(x), Electric Field E(x), $J_{ndiff}(x)$, $J_{ndrift}(x)$, $J_{pdiff}(x)$, $J_{pdrift}(x)$.

   b) Assume $N_D = 0$. Find N_A in cm^{-3} the left hand side.

3) Given the following expression for electron concentration: $n(x) = n_0 * e^{-x/Lo}$ where $n_0 = 10^{18}$cm^{-3} and $L_o = 1\mu m$.

   Find $J_{ndrift}(x)$.

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4) For the Band Diagram below:
   a) Find: Hole Concentration p(x), Electron Concentration n(x), Electric Field E(x), $J_{ndiff}(x)$, $J_{ndrift}(x)$, $J_{pdiff}(x)$, $J_{pdrift}(x)$.
   b) Find $N_D(x)$ assuming $N_A(x) = 0$.