

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

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

**EECS 170A**  
**Homework #2**

HW will be collected in discussion section.  
Please do not turn your HW in anywhere else.  
Due: Noon Thursday, October 13, 2011.

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

1	2	3	4	5	Total
/20	/20	/20	/20	/20	/100

- 1) Given Si at 300K where  $N_d = 10^{18} \text{ cm}^{-3}$  and  $N_a = 0$ . The Length = 10cm and Diameter = 1mm.  
Calculate electron concentration (n), hole concentration (p), electron mobility ( $\mu_n$ ), and Resistance (R).
- 2) Given Si at 300K where  $N_a = 10^{16} \text{ cm}^{-3}$  and  $N_d = 0$ . The Length = 1cm and Diameter = 10 $\mu\text{m}$ .  
Calculate electron concentration (n), hole concentration (p), hole mobility ( $\mu_p$ ), and Resistance (R).
- 3) In order to achieve a resistivity ( $\rho$ ) of 1 Ohm-cm:  
a) What values of  $N_a$  with  $N_d = 0$  is needed for a p-typed semiconductor?  
b) What values of  $N_d$  with  $N_a = 0$  is needed for a n-typed semiconductor?
- 4) Calculate a) The resistance (R) of a n-type Si doped wire with  $N_d = 10^{20} \text{ cm}^{-3}$  (Length = 1cm and Diameter = 1mm).  
b) The resistance (R) of a copper wire with a resistivity ( $\rho$ ) of 2 $\mu\text{Ohm-cm}$  (Length = 1cm and Diameter = 1mm).
- 5) Find the electron concentration (n) and hole concentration (p) of Si assuming  $N_a = N_d = 10^{16} \text{ cm}^{-3}$ .