

COURSE: U14EI 205 - BASIC ELECTRONICS ENGINEERING	ECE-I, Semester-II
---	--------------------

ASSIGNMENT-1

Topic	Assignment Posted On	Submission Due On
Semiconductor Theory	18.01.2016	28.01.2016

- 1 What is a signal? Sketch and explain different types of signals.
- 2 Explain the differences among conductors, insulators and semiconductors using the Energy Band Diagrams
- 3 Define (i) Mass action law (ii) Mobility and (iii) Conductivity
- 4 Explain how conduction takes place in intrinsic semiconductor
- 5 What is doping? Explain how n and p-type semiconductors are formed
- 6 Explain how conductivity changes with doping
- 7 What is Fermi level? Explain the effect of doping and temperature on Fermi level
- 8 An n-type Silicon bar 0.1 cm long and $100 \mu\text{m}^2$ in cross-sectional area has a majority carrier concentration of $5 \times 10^{20} / \text{m}^3$ and the carrier mobility is $0.13 \text{ m}^2 / \text{V-s}$ at 300°K . If the charge of an electron is $1.6 \times 10^{-19} \text{ C}$, then find the resistance of the bar.
- 9 Calculate the values of conductivity and resistivity of intrinsic Silicon semiconductor with hole mobility $\mu_p = 0.055 \text{ m}^2 / \text{V-s}$ and $\mu_n = 0.145 \text{ m}^2 / \text{V-s}$. Assume the concentration of electrons in the intrinsic semiconductor to be $1.5625 \times 10^{16} / \text{m}^3$
- 10 In a Germanium sample, a donor type impurity is added to the extent of 1 atom per 10^8 Germanium atoms. Show that the resistivity of the sample drops to $3.7 \Omega\text{-cm}$. The given parameters are: $\mu_n = 3800 \text{ cm}^2 / \text{Vs}$; $\mu_p = 1800 \text{ cm}^2 / \text{V-s}$; $n_i = 2.5 \times 10^{13} / \text{cm}^3$; $N_{\text{Ge}} = 4.41 \times 10^{22} / \text{cm}^3$; $q = 1.602 \times 10^{-19} \text{ C}$.

Instructions:

1. **Maintain a separate 200 pages note book** for BEL- Assignments and submit the solutions during the lunch break on or before due date @ **Room No: B-I-208**
2. **Write the questions and answer/solve them legibly and neatly**
3. **Make an honest effort to solve the assignment problems.** In case of difficulty, discuss with friends/ Teacher and refer to solutions as a last resort. **Finally, rework the solutions on your own for submission**
4. *Students will be graded on the quality of their work*

Faculty: K. Ashoka Reddy, Room #: BI-208