Printed pages: 3	EEC301
(Following paper code and roll No. to be filled in your answer book)	
Paper code: 131304	Roll No.

B TECH

(SEM III) THEORY EXAMINATION 2014-15

FUNDAMENTALS OF ELECTRONICS DEVICES

TIME: 3 Hours **Total Marks: 100**

Note: - *Answer all questions, all questions carry equal marks*

1. Attempt any **four part** of the following: 5X4

   (a) With suitable sketch describe briefly the diamond lattice.
   (b) What do you mean by mobility of carrier? How does it depend on temperature and doping concentration?
   (c) Calculate minimum resistivity of Silicon at 300K. Also derive its expression if any.
   (d) What is Hall Effect? What properties of a semiconductor are determined from Hall Effect experiments? Justify your answer.
   (e) Sketch the (211) plane and the (211) direction in a cubic crystal lattice.
   (f) In n-type germanium the donor concentration is a 1 atom per 10^8 germanium atom. If the effective mass of the electrons is one half the true mass, find the position of Fermi level from the edge of the conduction band of room temperature.

2. Attempt any **four part** of the following: 5X4

(a) Describe drift and diffusion of carriers, Also derive expression for Einstein's Relationship.

(b) Calculate the relaxation times for electrons and holes in silicon crystal.

(c) State and derive the continuity equation for electron.

(d) Consider p-type silicon at T=300K doped at N_a=5 X 10^{16} cm^{-3}. Assume that $\tau_{p0} = 5\times10^{-7} s$, D_p=25 cm^2/s and $\delta p(0) = 10^{15} cm^{-3}$. Determine the excess carrier in terms of distance x.

(e) Define quasi Fermi levels. Also show that for steady state condition the product of electron and hole concentrations is equal to $n_i^2 e^{(F_n - F_p)/KT}$, where symbols have their usual meaning.

(f) Explain the difference between florescence and phosphorescence with the help of suitable sketch.

3. Attempt any **two part** of the following: 10X2

(a) What do you mean by reverse bias breakdown? Calculate the thermal equilibrium electron and hole concentration in a compensated P-type silicon semiconductor at 300°K in which $N_A=10^{16}$ cm^{-3}, N_D=3 X 10^{15} cm^{-3} and N_i= 1.6 X 10^{10} cm^{-3}.

(b) Derive an expression for the current voltage relation in an ideal p-n junction diode.

(c) Explain the formation of built in potential across a p-n junction diode at equilibrium condition. Derive the expression for it assuming step junction. How is this built-in potential modified by the application of bias voltage?

4. Attempt any **two part** of the following: 10X2

(a) Enumerate the special features of MESFET. Explain its working and state the difference between normally on and normally off MESFETs with their characteristics.

(b) Explain how a bipolar Junction Transistor can be used as an amplifier. Define the emitter injection efficiency, current transfer ratio and base to collector current amplification factor.

(c) What are the advantages and disadvantages of FET over BJT? Describe the operation and characteristics of an enhancement type n channel MOSFET with help of energy band diagram of MOS structure.

5. Attempt any **two part** of the following: 10X2

(a) What are the basic constructional differences between a conventional p-n junction diode and a tunnel diode? Explain briefly the operation and characteristics of a tunnel diode.

(b) What is transferred electron effect? Describe a device based on this effect with suitable diagram in detail. Also draw is characteristics.

(c) Explain the operation and characteristic of silicon controlled rectifier. Also describe the application of the SCR and p-n-p-n diode.