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Total Number of Pages : 01

B.Tech
BSCP1207

4th Semester Back Examination 2018-19
PHYSICS OF SEMICONDUCTOR DEVICES
BRANCH : AEIE, CSE, ECE, EEE, EIE, ETC, IEE
Time : 3 Hours
Max Marks : 70
Q.CODE : F645

Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

- Q1** **Answer the following questions :** **(2 x 10)**
- a) What do you mean by effective mass of electron?
 - b) Define acceptor density and donor density?
 - c) Graphically show the variation of carrier concentration with temperature.
 - d) Define drift current and diffusion current.
 - e) Write down the Einstein Relation?
 - f) What do you mean by depletion layer and potential barrier?
 - g) What is early voltage and punch through voltage?
 - h) Compare the Schottky barrier and pn junction.
 - i) What do you mean by accumulation charge?
 - j) Distinguish between n-channel and p-channel MOSFET structure.
- Q2** a) Discuss the splitting of energy levels with reference to silicon atom. **(5)**
 b) What is band theory of solids? Give the energy band structure of insulators, semiconductors and conductors. **(5)**
- Q3** a) Explain the variation of Fermi energy level with doping concentration and temperature variation using suitable diagram and plot. **(5)**
 b) Derive an expression for drift current. **(5)**
- Q4** a) Derive an expression for the current density as a function of applied voltage in a pn junction **(5)**
 b) Derive an expression for minority carrier concentration for hole in emitter region and hence find the expression for base current. **(5)**
- Q5** a) Explain Schottky effect. Show that actual Schottky barrier height proportionately related to position of maximum barrier height due to Schottky effect. **(5)**
 b) Derive expression for that flat band voltage of a MOS capacitor with p-type semiconductor substrate. **(5)**
- Q6** Derive equation for electrons, holes and $n_0 p_0$ product, when the semiconductor is in equilibrium condition. **(10)**
- Q7** What is junction breakdown? Discuss different breakdown that is associated with a PN junction. **(10)**
- Q8** **Write short answer on any TWO :** **(5 x 2)**
- a) Direct and indirect band gap semiconductor
 - b) Ebers-Moll model
 - c) CMOS Technology