

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 714206N****Date: 10-01-2013****Subject Name: Semiconductor Physics (Minor Elective –I)****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Discuss the different bands of energy and explain what phenomenon causes energy levels to split. **07**
(b) Derive the equation of Electric Field in the space charge region. **07**

- Q.2** (a) What is Effective Mass of a particle? Explain in brief. **07**
(b) Briefly explain the effect of the width of band gap region with intrinsic carrier density. **07**

OR

- (b) Determine the location of Fermi level with respect to the middle of the band gap in intrinsic silicon & intrinsic gallium arsenide at room temperature. Take $k=8.61 \times 10^{-5}$ eV/K **07**

- Q.3** (a) Discuss the effects of collision & energy exchanges in brief. **07**
(b) Explain Surface recombination phenomenon. **07**

OR

- Q.3** (a) Discuss the various conditions of electric field for a two valley semiconductors. **07**
(b) Why and how does mobility depend on doping? Explain. **07**

- Q.4** (a) The depletion region extends deeper into the lightly doped region of the PN diode. Discuss Why. **07**
(b) Explain the process of Diffusion and its effects. **07**

OR

- Q.4** (a) Discuss the static characteristics of the Bipolar Transistor. **07**
Q.4 (b) Discuss the operation of Bidirectional Thyristor. **07**

- Q.5** (a) Discuss the various capacitances formed in junction diode and its effects. **07**
(b) Explain principles of operation of a MESFET. **07**

OR

- Q.5** (a) Discuss the charge distribution of ideal MOS diode in various conditions. **07**
(b) Discuss the usage of Diode as switch and explain why a small capacitance is preferred when a diode is used as a switch. **07**
