Seat No.: _____ Enrolment No._____

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 x 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**

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