Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 152401 **Date: 14-05-2013**

Subject Name: Power Electronics Devices and Components

Time: 10.30 am - 01.00 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)	Draw the Block Diagram of Power Electronics System and Explain functionality and working of each block in detail.	**07**
	(b)	Explain V-I Characteristics of SCR and Derive equation of I_A using two transistor analogy of SCR.	**07**
Q.2	(a)	Design a Relaxation Oscillator using UJT for the triggering of SCR. The data is as follows. $\eta = 0.72$, $I_p = 0.6$mA, $V_v = 1$V, $I_v = 2.5$mA, $V_{BB} = 18$V, $R_{BB} = 5$kΩ, Leakage current with open emitter = 4.2mA. The firing frequency is 2 KHz. For C = 0.04μF, compute necessary resistances used in circuit.	**07**
	(b)	Define SOA. Explain FBSOA and RBSOA of Power BJT.	**07**
		OR	
	(b)	Explain the Reverse Recovery Characteristics of power diode and Derive the equation for the Reverse Recovery Time t_{rr} .	**07**
Q.3	(a)	Define commutation. List different methods of commutation. Explain Class- D commutation with necessary circuit and waveforms	**07**
	(b)	List the causes of the voltage transient in thyristor. Suggest Protection circuit to ensure protection against high dv/dt and explain its working with neat sketch.	**07**
		OR	
Q.3	(a)	Define Turn-On time of Thyristor. List different methods of Triggering. Explain R-C Triggering circuit with necessary circuit and waveforms.	**07**
	(b)	List the different losses occurring in Thyristor. Explain the Thermal Resistance. Explain importance of Heat Sink.	**07**
Q.4	(a)	Explain four mode operation of TRIAC.	**07**
	(b)	Compare: 1. Schottky Diode and PIN Diode. 2. Power BJT and Power MOSFET.	**07**
		OR	
Q. 4	(a)	Explain the construction and V- I characteristics of MCT.	**07**
	(b)	Explain construction, working, transfer and output characteristics of N-Channel Enhancement Type MOSFET.	**07**
Q.5	(a)	Write a Short Note on Materials used in Power Semiconductor Devices.	**07**
	(b)	Explain the construction and V- I characteristics of IGBT.	**07**
		OR	
Q.5	(a)	Write a Short Note on Power Integrated Circuit.	**07**
	(b)	What is Gate Drive? Explain gate drive for IGBT.	**07**

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