

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. $\eta = 0.72$, $I_p = 0.6\text{mA}$, $V_v = 1\text{V}$, $I_v = 2.5\text{mA}$, $V_{BB} = 18\text{V}$, $R_{BB} = 5\text{k}\Omega$, Leakage current with open emitter = 4.2mA . The firing frequency is 2KHz . For $C = 0.04\mu\text{F}$, 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. **07**
 2. Power BJT and Power MOSFET.
- 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**
