

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**PDDC SEM-IV Examination-Nov-2011**

**Subject code: X40902**

**Date: 23/11/2011**

**Subject Name: POWER ELECTRONICS-I**

**Time: 2.30 pm -5.00 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)** Define turn-on time as applied to SCR with necessary conditions and describe various turn on methods of SCR. **07**

**(b)** What is snubber circuit? Why is it needed? Draw such circuit for a SCR and give guidelines for selecting it's components. **07**

**Q.2 (a)** Define turnoff time of SCR and explain how an auxiliary SCR and a capacitor can be used to turn-off conducting SCR (Class-D turn off-Impulse commutation method)? Draw necessary waveforms. **07**

**(b)** Explain the working of UJT relaxation oscillator circuit. Derive the expression for frequency of triggering and firing angle delay in terms of  $\tau$ , charging resistance etc. **07**

**OR**

**(b)** Describe IGBT with construction and working characteristics. **07**

**Q.3 (a)** Describe construction and working of a SCR. Analyze it's performance using two transistor Analogy. Derive it's expression for it's anode current in terms of current gain ' $\beta$ ' and leakage Current  $I_{Co}$  **07**

**(b)** Describe TRIAC four mode operation and it's application as Fan Regulator with necessary sketches. **07**

**OR**

**Q.3 (a)** Draw the circuit of a single phase fully controlled converter with R-L load. Derive necessary equations and sketch output waveforms. **07**

**(b)** Describe the use of pulse transformer in triggering of SCRs, also describe the uses of freewheeling diode in converters circuit. **07**

**Q.4 (a)** Describe Three phase fully controlled bridge rectifier with necessary waveforms. **07**

- (b) Draw the neat circuit diagram of a Jones chopper controlling the speed of a D.C series motor. Explain it's working with the help of various wave Forms. Obtain expression for (i) Capacitor voltage (ii) Toff period (iii) Relation between battery voltage & capacitor voltage (iv) Value of Capacitor. **07**

**OR**

- Q.4 (a)** What is chopper? Explain methods of load voltage control **07**

- (b) Discuss the principles of SCR voltage choppers as (i) Buck convector (ii) Boost converter **07**

- Q.5 (a)** With a neat circuit diagram and wave forms describe the Morgan's Chopper circuit states its applications & limitations. **07**

- (b) Explain DC motor speed control using chopper. **07**

**OR**

- Q.5 (a)** Discuss constant H.P and constant Torque operation of speed control of motors. Specify there by their field of applications. **07**

- (b) Sketch a neat circuit diagram of the speed regulation of a D.C Shunt Motor by armature Voltage control. Explain it's working with the help of neat wave forms. **07**

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