

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. Sem. - V - Examination – June- 2011

Subject code: 150903

Subject Name: Power Electronics – I

Date: 24/06/2011

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) Using voltage and current waveforms, explain the dynamic turn-on and turn-off processes (characteristics). **07**
(b) Briefly explain the current ratings of SCR. **07**

- Q.2** (a) What is the necessity of connecting SCRs in series? What are the problems associated with series connections of SCRs? How are they eliminated? **07**
(b) State the causes of over-voltage in thyristor circuits. Briefly explain over-voltage protection of SCR. **07**

OR

- (b) Write short notes on (i) Diac (ii) Triac, with regard to their working and V-I characteristics. **07**

- Q.3** (a) Explain UJT based triggering of thyristor. **07**
(b) Using relevant circuit diagram and waveforms, explain Class-C (Complimentary) forced commutation method. **07**

OR

- Q.3** (a) Latching current for an SCR inserted in between a dc voltage of 200 V and the load is 100 mA. Compute the minimum width of gate-pulse current required to turn-on this SCR in case the load consists of (a) $L = 0.2$ H (b) $L = 2.0$ H in series with $R = 20$ ohm. **07**
(b) Draw the thermal equivalent circuit of an SCR. Enlist the mounting techniques with their relevant diagrams. **07**

- Q.4** (a) For a single phase half wave controlled converter with RLE load, draw the circuit diagram and waveforms of input & output voltages and currents, and voltage across SCR. Derive the mathematical expressions of output voltage. **07**
(b) Using relevant circuit diagram, briefly explain three phase full converter connected to RLE load. Draw the waveforms of output voltage for firing angle [a] 0° [b] 60° . **07**

OR

- Q.4** (a) A dc battery of 100 V is charged through a resistance of 10 ohm from a 230V, 50 Hz, single phase ac source, via a single SCR. Find the power supplied to the battery and that dissipated in the resistance. Also calculate supply power factor. **07**
(b) Using relevant circuit diagram and waveforms, briefly explain single phase semi-controlled bridge converter consisting of RLE load and a freewheeling diode connected across the load. State the advantages of freewheeling diode. **07**

- Q.5** (a) Explain the concept of 'Dual Converter'. Using circuit diagram, 07
briefly explain the working of any one type of dual converter.
- (b) State the control strategies adopted to control the output voltage in 07
chopper. Explain 'Step-up Chopper'.

OR

- Q.5** (a) State the principles of DC motor speed control. Explain single phase 07
semi-converter DC motor drive.
- (b) Using relevant circuit diagram and waveforms, explain regenerative 07
braking control in DC machines using chopper circuit.

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