Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: 171002 **Date: 02-12-2014**

Subject Name: Power Electronics

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) Answer the following in brief **08**

(i) What is the need of commutation in SCR circuits? Explain the class-B self commutation in SCR circuits.

(ii) What are the advantages of IGBTs? Explain the static and dynamic latch ups in an IGBT.

(b) Answer the following **06**

(i) What is the difference between resistance trigger and RC trigger circuits? Draw the RC half wave trigger circuit for one SCR and describe how the output voltage is controlled by varying the resistance.

(ii) Explain effect of freewheeling diode, how this diode improves the power factor of the systems.

Q.2 (a) Explain the rectifying and inverting mode of operation of single phase fully controlled bridge converter with inductive load. Draw the associated waveforms. **07**

(b) Calculate the number of SCRs , each with rating of 600 V, 50 A required in each branch of a series and parallel combination for a circuit with the total voltage and current rating of 7.5 kV and 800 A. Assume derating factor of 15% **07**

OR

(b) A single phase half wave converter is used to supply power to a load of impedance 8 Ω from 230 V, 50 Hz ac supply at the firing angle of 60^0. Calculate average load voltage, load current and RMS load voltage. **07**

Q.3 (a) Explain the principle of an inverter. With help of neat diagram and associated waveform explain the operation of single phase half bridge voltage source inverter. **07**

(b) Explain the principle of operation of step down Chopper with resistive load. Differentiate between constant frequency and variable frequency operation of this chopper. **07**

OR

Q.3 (a) With an appropriate power diagram, discuss the principle of working of three phase bridge inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for 180^0 and resistive load is star connected. **07**

(b) With the help of a neat circuit diagram and associated waveforms, discuss the operation of Buck-Boost converter. List the advantages and disadvantages of this type of converter. **07**

Q.4 (a) What is forced commutation? With help of circuit diagram and necessary waveform explain the auxiliary (Class D) commutation. **07**

(b) Give the merits and demerits of GTO as compared to SCR. Explain the turn-on and turn-off process in a GTO with help of appropriate voltage and current waveforms. **07**

OR

Q.4	**(a)**	Draw a circuit diagram for ramp and pedestal trigger circuit used for the single phase semi converter. Describe its operation with appropriate waveforms.	**07**
	(b)	With the help of basic structural diagram explain the operation of DIAC and TRIAC.	**07**
Q.5	**(a)**	List and explain performance parameters of inverters	**07**
	(b)	Write short note on SMPS and UPS.	**07**

OR

Q.5	**(a)**	Explain the various techniques of improving power factor in three phase controlled converters.	**07**
	(b)	Write short notes on dielectric heating and induction heating	**07**

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