Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–IV • EXAMINATION – SUMMER 2013

Subject Code: X40902 **Date: 06-06-2013**

Subject Name: Power Electronics - I

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)**	Define turn-on time as applied to SCR with necessary conditions and describe various turn on methods of SCR.	**07**
	(b)	Explain turnoff behavior of SCR. Classify SCR turnoff methods and Explain class C commutation method used to turn-off conducting SCR	**07**
Q.2	**(a)**	List various gate triggering methods. Describe the use of pulse transformer in triggering of SCRs and uses of freewheeling diode in converters circuit.	**07**
	(b)	Explain with the help of associated waveforms the working of a UJT triggered SCR circuit in which constant current charging is accomplished. Discuss design of such circuit by deriving necessary expression for (i) Time period of Pulse (ii) Minimum and Maximum value of emitter resistance and corresponding time period of pulse.	**07**
		OR	
	(b)	Describe IGBT with construction and working characteristics.	**07**
Q.3	**(a)**	What is necessity of connecting SCRs in parallel? Indicates problems associated with it and discuss the common methods of current sharing of parallel connected SCRs.	**07**
	(b)	Draw the circuit configuration of step up chopper and explain its working. Derive its output voltage equation in terms of duty cycle and input voltage.	**07**
		OR	
Q.3	**(a)**	Draw the circuit of a single phase fully controlled converter with R-L-E load. Derive necessary equations and sketch output 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**
Q.4	**(a)**	Describe Three phase fully controlled bridge rectifier with necessary waveforms.	**07**
	(b)	What is a snubber circuit? How are the elements of the snubber circuit calculated?	**07**
		OR	
Q.4	**(a)**	What is chopper? Explain methods of load voltage control.	**07**
	(b)	Classify various chopper circuits based on principle of operation, circuit configuration etc.	**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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