Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER 2013

Subject Code: 150903 **Date: 04-12-2013**

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)**	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**
	(b)	Discuss TRIAC four mode operation and explain it's application as a Fan Regulator.	**07**
Q.2	**(a)**	Discuss the effect of positive and negative gate bias on Gate triggering of SCR. Explain considerations for design of gate trigger circuit.	**07**
	(b)	Explain turnoff behavior of SCR and discuss major specifications associated with it.	**07**
		OR	
	(b)	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**
Q.3	**(a)**	For a single phase fully 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)	Discuss the uses of following with reference to SCR phase controlled rectifier circuit supplying power to inductive load. (i) Pulse Transformer (ii) Freewheeling diode.	**07**
		OR	
Q.3	**(a)**	Draw three phase full wave converter circuits with R-L load and explain the working with waveforms for continues current through load. Derive expression for output DC voltage. Hence state the maximum output voltage and determine the triggering angle α for half the maximum output voltage.	**07**
	(b)	Explain principles of speed control of DC motor with necessary operating modes.	**07**
Q.4	**(a)**	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**
	(b)	A chopper operating on TRC constant frequency principle is feeding a dc series motor having an armature resistance 0.06ohm and field resistance 0.03 ohm. The average circuit current is 15 amp and the chopper frequency is 500 Hz. The back emf of the motor is 1000.Find the period of conduction and blocking. The chopper input is 200Volts.	**07**
		OR	
Q.4	**(a)**	With the neat block diagram and waveforms discuss switch mode regulator and classify them.	**07**
	(b)	What is a snubber circuit? How are the elements of the snubber circuit calculated?	**07**
Q.5	**(a)**	Discuss the various techniques of improving the power factor in phase controlled converters. Explain PWM techniques in detail with necessary sketch and waveforms	**07**
	(b)	Discuss the principle of Regenerative braking control of DC to DC converter fed separately excited dc motor with necessary sketch and waveforms.	**07**
		OR	
Q.5	**(a)**	Discuss following in Brief. (i) MOV-Metal Oxide Variastors (ii) EMI-Electromagnetic interference protection	**10**
	(b)	Define following terms (i) Turn on time (ii) Turn off time (iii)Converter grade SCR (iv) Inverter grade SCR	**04**

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