Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 171002 Date: 08/06/2012

Subject Name: Power Electronics

Time: 02:30 pm – 05:00 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 the principle of operation of SCR with (i) Device structure (ii) Characteristics and (iii) two transistor analogy.	**07**
	(b)	Describe the construction and working of IGBT. Also enumerate the advantages of IGBT over BJT and MOSFET.	**07**
Q.2	**(a)**	What are the various thyristor ratings?	**07**
	(b)	Describe any two forced commutation methods.	**07**
		OR	
	(b)	What are the needs of series and parallel operations of thyristors? Explain the problems with series and parallel operations of thyristors and possible solutions.	**07**
Q.3	**(a)**	Explain Single phase Full (Bridge) controlled rectifier with resistive load in detail.	**07**
	(b)	Explain the principle of operation of pulse width modulated inverters with performance parameters.	**07**
		OR	
Q.3	**(a)**	Explain three-phase half-wave controlled rectifier with resistive load.	**07**
	(b)	Describe the operation of three-phase inverter with 180-Degree conduction.	**07**
Q.4	**(a)**	What is the principle of operation of step-down converter? Show complete analysis of step-down converter with RL load with all necessary diagrams.	**07**
	(b)	Describe Uninterruptible power supply with necessary diagrams in detail.	**07**
		OR	
Q.4	**(a)**	Show chopper classification and explain any four types of chopper with necessary diagrams in detail.	**07**
	(b)	Describe Switched mode power supply with necessary diagrams in detail.	**07**
Q.5	**(a)**	If the half-wave controlled rectifier has a purely resistive load of R and the delay angle is $\pi/3$, determine (i) rectification efficiency (ii) Form factor (iii) Ripple factor (iv) Transformer utilization factor and (v) Peak inverse voltage of SCR.	**07**
	(b)	The single-phase half-bridge inverter has a resistive load of 2.4 Ω and the dc input voltage is 48V. Determine (i) the rms output voltage at the fundamental frequency, (ii) the output power, (iii) the average and peak currents of each transistor, (iv) the peak reverse blocking voltage of each transistor, (v) the THD, (vi) the DF, (vii) the HF and DF of the LOH.	**07**
		OR	
Q.5	**(a)**	A boost regulator has an input voltage of 5 V. The average output voltage is 15V and the average load current is 0.5 A. The switching frequency is 25 kHz. If L = 150 μH and C = 220 μF, determine (i) the duty cycle, (ii) the ripple current of inductor, (iii) the peak current of inductor, (iv) the ripple voltage of filter capacitor, and (v) the critical values of L and C.	**07**
	(b)	Explain Battery charger with necessary diagrams.	**07**

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