Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – SUMMER • 2014

Subject Code: X 71102 **Date: 30-05-2014**

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)**	Define following terms with respect to SCR. **1.** Holding current **2.** Latching current **3.** Minimum Gate current I_{gmin} **4.** Forward Breakover Voltage V_{BO}	**04**
	(b)	What is the purpose of di/dt protection? Draw the circuit of di/dt protection.	**03**
	(c)	Explain the operation of the SCR using the two transistor analogy. Obtain the condition for breakdown of the device.	**07**
Q.2	**(a)**	Explain thyristor turn off mechanism in detail. Also explain the term: recombination time, turn off time and reverse recovered charge.	**07**
	(b)	Explain V-I Characteristics of TRIAC.	**07**
		OR	
	(b)	Describe the construction and working of IGBT. Also mention the advantages of IGBT over BJT and MOSFET.	**07**
Q.3	**(a)**	Describe the operation of a single phase semiconverter with R-L load with relevant waveforms	**07**
	(b)	Explain the operation of three phase half wave converter with inductive load and also sketch the associated waveforms.	**07**
		OR	
Q.3	**(a)**	Explain single phase full (bridge) controlled rectifier with resistive load in detail.	**07**
	(b)	The single phase dual converter is operated from a 120-V 60 Hz supply and delivers ripple-free average current of I_{dc} = 20 mA. The circulating inductance is L_r = 5 mH, and the delay angles are $\alpha_1 = 30^\circ$ and $\alpha_2 = 150^\circ$. Calculate the peak circulating current and the peak current of converter 1.	**07**
Q.4	**(a)**	Explain the two quadrant dc chopper operation with RLE load using suitable waveforms.	**07**
	(b)	The buck-boost regulator has an input voltage of V_s = 12V. The duty cycle k = 0.25 and the switching frequency is 25 kHz. The inductance L = 150µH and C = 220µF. The average load current I_a = 1.25A. Determine (i) the average output voltage, V_a; (ii) the peak-to-peak output voltage ripple,(iii) the peak-to-peak ripple current of inductor,(iv) the peak current of transistor.	**07**
		OR	
Q.4	**(a)**	Explain the principle of operation of step down chopper with RL load. Derive the formula of peak-to-peak ripple current for step down chopper.	**07**
	(b)	Explain the operation of single phase half bridge inverter with a neat sketch.	**07**
Q.5	**(a)**	Explain following performance parameters of inverter. (i) Harmonic factor HF_n (ii) Total Harmonic Distortion THD (iii) Distortion factor DF (iv) Lowest order Harmonic LOH	**07**
	(b)	Describe Switched Mode Power Supply with necessary diagram in detail.	**07**
		OR	
Q.5	**(a)**	Explain the operation of single phase full bridge inverter with neat sketch.	**07**
	(b)	Write short note on Dielectric heating.	**07**

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