Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code:X71102 **Date:11/12/2015**

Subject Name: Power Electronics

Time: 10:30pm to 1:00pm **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 **07**

1. Latching current
2. The holding current
3. On state voltage
4. Forward dv/dt rating
5. Commutation
6. Firing angle
7. Duty cycle

(b) Explain the function of the following: **07**

(i) Free –wheeling diode (ii) chopper (iii) heat sink

Q.2 **(a)** Discuss the various turn on methods of a thyristor **07**

(b) Describe the construction and working of IGBT. Also enumerate the advantages of IGBT over BJT and MOSFET. **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)** Derive the expressions for the average load voltage, average load current, Rms load voltage of a single phase half-wave controlled rectifier with resistive load. Show the necessary waveforms. **07**

(b) Describe the working of three phase half-wave converters with circuit diagram and waveforms. **07**

OR

Q.3 **(a)** State different commutation method of SCR. Explain any two. **07**

(b) In single phase half wave converter has a purely resistive load of R and the delay angle is $\alpha = \pi/2$,determine (a) the rectification efficiency (b) the form factor (FF) (c) the ripple factor (RF) (d) the TUF and (c) the peak inverse voltage (PIV) of thyristor . **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) The Buck regulator has an input voltage of Vs =12v.The required average output voltage is Va = 5v at R=500 Ω and the peak-to-peak output ripple voltage is 20 mv. The switching frequency is 25 kHz. If the peak-to-peak ripple current of inductor is limited to 0.8 A, determine (a) the duty cycle k t(b) the filter inductance L and (c) the filter capacitor C and (d) the critical values of L and C. **07**

OR

Q.4 **(a)** Write short note on Uninterruptible Power Supply. **07**

	(b)	Describe the working of a three phase bridge inverter for 120° conduction with circuit diagram and waveforms.	**07**
Q.5	**(a)**	A step-up chopper has input voltage of 220v and output voltage of 660v. If the conducting time of thyristor-chopper is 100 μs, compute the pulse width of output voltage. In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage.	**07**
	(b)	Write short note on Switched mode Power Supply.	**07**

OR

Q.5	**(a)**	Define and discuss switching mode regulators. Explain Boost regulator with circuit diagram and waveforms.	**07**
	(b)	List and explain performance parameters of inverters.	**07**

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