Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(New) • EXAMINATION – WINTER 2016

Subject Code:2150903 **Date:30/11/2016**

Subject Name:Power Electronics – I

Time:10:30 AM to 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.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Differentiate between bipolar and unipolar devices.	
	2	Define holding current.	
	3	What is meant by rate effect?	
	4	Draw symbols of SUS and SBS.	
	5	What is valley voltage?	
	6	Why pulse transformer is used in firing (triggering) circuit?	
	7	Give types of commutation.	
	8	What is an ac voltage controller? Give some of its industrial applications.	
	9	What do you understand by harmonics?	
	10	Define conduction angle.	
	11	Enlist sources of EMI (Electromagnetic Interference).	
	12	Define line commutation.	
	13	What is chopper? Why it is used?	
	14	State advantages of chopper drives.	
Q.2	**(a)**	Explain Insulated Gate Commutated Thyristor (IGCT).	**03**
	(b)	Draw symbol and V-I characteristics of DIAC and TRIAC.	**04**
	(c)	Explain steady state V-I characteristics of power BJT. Also discuss the second breakdown phenomenon in brief.	**07**
		OR	
	(c)	Explain construction of IGBT. State advantages of IGBT over power BJT.	**07**
Q.3	**(a)**	Draw and explain resistance firing circuit for SCR.	**03**
	(b)	Draw and explain DIAC firing circuit.	**04**
	(c)	What is snubber circuit? How elements of snubber circuits are calculated?	**07**
		OR	
Q.3	**(a)**	Why gate driver circuit is required for SCR?	**03**
	(b)	Explain semiconductor fuse.	**04**
	(c)	Describe parallel operation of thyristors.	**07**
Q.4	**(a)**	Explain significance of freewheeling diode in controlled rectifiers.	**03**
	(b)	Compare symmetrical semiconverter with asymmetrical semiconverter.	**04**
	(c)	Explain operation of half wave controlled rectifier with R load using waveforms. Also derive expression of average voltage for it.	**07**
		OR	

Q.4	**(a)**	Write short note on single phase dual converter.	**03**
	(b)	Compare half wave controlled rectifier with full wave controlled rectifier.	**04**
	(c)	Draw circuit diagram of single phase fully controlled bridge converter with R-L load. Derive expression of average & RMS load voltage for it.	**07**
Q.5	**(a)**	Explain principal of operation of chopper.	**03**
	(b)	Explain working of step-down chopper with R-L load in discontinuous current mode and draw waveforms.	**04**
	(c)	Explain single phase full wave converter drive in continuous conduction mode with necessary waveforms.	**07**

OR

Q.5	**(a)**	Explain only four quadrant operation of dual converter.	**03**
	(b)	Explain briefly principle of regenerative braking.	**04**
	(c)	Explain modes of operation of current commutated chopper with its waveforms.	**07**

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