Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2150903 **Date:10/05/2017**

Subject Name: Power Electronics – I

Time: 02:30 PM to 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.**

			MARKS
Q.1		**Short Questions**	**14**
	1	**What is snubber circuit? Why is it needed?**	
	2	**What are the essential requirements of a gate triggering pulse?**	
	3	**Why equalizing circuits are provided in series connection of thyistors?**	
	4	**Define intrinsic standoff ratio of UJT?**	
	5	**What is Commutation? List various conditions necessary for the commutation of SCR.**	
	6	**Explain difference between half controlled and full controlled Bridge rectifier.**	
	7	**Explain the terms Duty cycle and chopper frequency.**	
	8	**How thyristors are protected against over voltage and over current.**	
	9	**Define and explain latching and holding current.**	
	10	**What is the peak inverse voltage (PIV) across a thyristor which is in the off state in a three phase rectifier?**	
	11	**What are the effects of source inductance in the operation of a rectifier?**	
	12	**Define the string efficiency and de-rating factor of thyristors connected in parallel.**	
	13	**Explain why the IGBT is called voltage controlled device?**	
	14	**Explain the principle of operation of power MOSFET.**	
Q.2	**(a)**	**Describe the use of pulse transformer in triggering of SCRs.**	**03**
	(b)	**Draw with neat circuit diagram static V-I characteristic of an IGBT.**	**04**
	(c)	**Describe TRIAC four mode operation and it's application as Fan Regulator with necessary sketches.**	**07**
		OR	
	(c)	**Give comparison between power MOSFET and IGBT with respect to their operating frequency range, on state voltage drop range, type of snubber circuit requirement, maximum VI ratings, static VI characteristics, applications and circuit symbol.**	**07**
Q.3	**(a)**	**Give a comparison between Regenerative and Rheostatic braking?**	**03**
	(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.**	**04**
	(c)	**Design a UJT relaxation oscillator using UJT 2N2646, for triggering an SCR. The UJT has following characteristics. $\eta = 0.7$, $I_p = 50\mu A$, $V_v = 2V$, $I_v = 6mA$, $V_{BB} = 20V$, $R_{BB} = 7K8$, $I_{EO} = 2mA$, also determine the limits for the output frequency of the oscillator.**	**07**
		OR	
Q.3	**(a)**	**Describe the uses of freewheeling diode in converters circuit.**	**03**
	(b)	**Describe the principle of operation of Buck - Boost DC -DC converter.**	**04**
	(c)	**For a single phase full wave controlled converter with RLE load, draw the circuit diagram and necessary waveforms. Derive the mathematical expressions of output voltage.**	**07**

Q.4	**(a)**	**List the advantages and disadvantages of boost regulator.**	**03**
	(b)	**Define any four important ratings of Thyristor.**	**04**
	(c)	**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**

OR

Q.4	**(a)**	**What is chopper? List the methods of load voltage control.**	**03**
	(b)	**Compare TRIAC and SCR.**	**04**
	(c)	**With a neat circuit diagram and wave forms describe the Morgan's Chopper circuit states its applications & limitations.**	**07**
Q.5	**(a)**	**Give basic topologies of switch mode regulators.**	**03**
	(b)	**Explain four quadrant operation of DC Drive with Phase controlled converters.**	**04**
	(c)	**With the help of relevant waveforms explain Class C complementary commutation circuit.**	**07**

OR

Q.5	**(a)**	**Discuss all factors which decide the continuous current and discontinuous current modes of operation of a converter.**	**03**
	(b)	**What is di/dt effect and it's protection in a Thyristor?**	**04**
	(c)	**Give block diagram for closed loop speed control of DC drive. Explain working of each block.**	**07**

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