Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:2150903 Date:09-01-2023

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Draw only circuit diagram and write only output voltage equation of a buck-boost chopper.	**03**
	(b)	Draw only circuit diagram and waveforms of 1-ph asymmetric semi converter.	**04**
	(c)	Explain Class-C commutation of SCR.	**07**
Q.2	**(a)**	What is the significance of drift layer (n-) in Power Diode?	**03**
	(b)	Compare R, RC and UJT triggering circuits.	**04**
	(c)	Explain the principle of regenerative braking.	**07**
		OR	
	(c)	Explain the operation of 1-ph full-wave phase controlled rectifier with R load, with necessary waveforms. Derive the equation of average output voltage.	**07**
Q.3	**(a)**	Draw only circuit diagrams with all the required notations: (i) 1-ph half-wave converter (ii) 1-ph half-bridge converter	**03**
	(b)	Draw only circuit diagrams with all the required notations: (i) Two transistor model of SCR (ii) Class-D commutation of SCR	**04**
	(c)	Explain step down chopper and derive the output voltage equation.	**07**
		OR	
Q.3	**(a)**	With reference to series connected SCRs: (i) What is string efficiency? (ii) What is derating factor? (iii) How system reliability varies with string efficiency? How system reliability varies with derating factor?	**03**
	(b)	Draw only circuit diagram and waveforms of 1-ph symmetric semi converter.	**04**
	(c)	Explain UJT triggering circuit with necessary waveforms.	**07**
Q.4	**(a)**	Briefly explain rectification mode and inversion mode of AC to DC converter.	**03**
	(b)	What is continues conduction mode and discontinues conduction mode of operation of a chopper?	**04**
	(c)	Explain 3-ph fully controlled converter based DC drive.	**07**
		OR	
Q.4	**(a)**	What is the difference between regenerative braking and rheostatic braking? Draw only circuit diagram of rheostatic brake control in DC drive.	**03**

	(b)	Why a DC to DC converter is called "chopper"? Classify various DC choppers.	**04**
	(c)	Explain static equalizing circuit required for series connected SCRs.	**07**
Q.5	**(a)**	Enlist all the methods (i) to turn on SCR (ii) to trigger gate of SCR	**03**
	(b)	Give difference between voltage commutated chopper and current commutated chopper.	**04**
	(c)	Explain the principle of operation of Power MOSFET.	**07**

OR

Q.5	**(a)**	Why isolation is provided between control circuit and power circuit? Enlist all the possible methods of isolation.	**03**
	(b)	Draw only vertical structure and V-I characteristic of IGBT.	**04**
	(c)	Explain the principle of operation of 1-ph dual converter.	**07**

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