Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code: 3140915 Date:27-05-2025

Subject Name: Power Electronics

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 and explain static characteristics of SCR.	**03**
	(b)	Describe bipolar PWM techniques in detail.	**04**
	(c)	Discuss three-phase semi converter connected to RL load in continuous conduction mode with circuit diagram and waveforms of output voltage/current for firing angle of 30^0.	**07**
Q.2	**(a)**	Discuss the need of freewheeling diode in phase-controlled rectifier.	**03**
	(b)	Discuss the requirement of Snubber circuit for reliable operation of an SCR.	**04**
	(c)	Derive output voltage equation for single phase full wave controlled rectifier with R load. Assume α is firing angle.	**07**
		OR	
	(c)	Explain working of single phase to single phase step down cycloconverter with circuit diagram and waveforms for continuous and discontinuous load current.	**07**
Q.3	**(a)**	SCR is not suitable for dc to ac converter for low power applications. Justify.	**03**
	(b)	Describe the SVPWM control technique in brief.	**04**
	(c)	Explain the working of three phase 120^0 mode voltage source inverter. Also draw the necessary waveforms and circuit diagrams.	**07**
		OR	
Q.3	**(a)**	Classify different techniques for voltage control of inverter. Discuss any one in brief.	**03**
	(b)	Describe the SPWM control technique in detail.	**04**
	(c)	Explain the working of three phase 180^0 mode voltage source inverter. Also draw the necessary waveforms and circuit diagrams.	**07**
Q.4	**(a)**	Discuss the operation of DC/DC Flyback converter.	**03**
	(b)	Discuss the effect of high switching frequency on harmonics spectrum in single phase full bridge voltage source inverter.	**04**
	(c)	Describe the dual converter operation with circulating current mode in case of single phase input supply. Also draw the voltage and current waveforms.	**07**
		OR	
Q.4	**(a)**	Discuss single phase full wave AC voltage controller with circuit diagram and necessary waveforms.	**03**
	(b)	Discuss matrix converter with necessary circuit diagram.	**04**
	(c)	Explain integral cycle control of AC voltage controllers with necessary equations and waveforms.	**07**
Q.5	**(a)**	Explain the basic structure of IGBT with schematic diagram.	**03**
	(b)	Discuss two transistor model of SCR.	**04**
	(c)	Explain multi-quadrant operation of DC-DC converter.	**07**

OR

Q.5	**(a)**	Explain the basic structure of MOSFET with schematic diagram.	**03**
	(b)	List out the various SCR turn on methods. Discuss any one in detail.	**04**
	(c)	Explain the working of buck converter with necessary circuit diagrams and waveforms.	**07**

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