Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3140915 Date:03-12-2024

Subject Name:Power Electronics

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

			Marks
Q.1	**(a)**	Explain IGBT with its physical construction diagram and characteristics.	**03**
	(b)	Draw the SCR static V-I characteristics and explain its behavior in forward conduction, forward blocking and reverse blocking modes.	**04**
	(c)	Describe the working of UJT Relaxation Oscillator circuit. Discuss its Design criterion.	**07**
Q.2	**(a)**	Describe briefly three adverse effects of electromagnetic interference. Discuss briefly one remedial step to reduce EMI	**03**
	(b)	Define and explain the need of snuber circuit. Draw such circuit for SCR and give guidelines for selecting its components.	**04**
	(c)	Discuss discontinuous mode of operation in buck boost converter with waveforms.	**07**
		OR	
	(c)	Draw the circuit of a single phase fully controlled converter with R-L load. Derive necessary equations and sketch output waveforms.	**07**
Q.3	**(a)**	What do you mean by freewheeling action? Explain How diode can provide freewheeling action?	**03**
	(b)	Give four points of difference between on-off control and phase angle control.	**04**
	(c)	Discuss the various techniques of improving power factor in phase controlled converters. Explain PWM techniques in detail with necessary waveforms.	**07**
		OR	
Q.3	**(a)**	Distinguish between full controlled bridge converter and half controlled bridge converter.	**03**
	(b)	Explain pulse transformer and opto-coupler	**04**
	(c)	Discuss operation of Flyback converter. Draw its circuit diagram and waveforms.	**07**
Q.4	**(a)**	Write advantages and disadvantages of PWM technique to generate gate Pulse.	**03**
	(b)	Compare 120˚ and 180˚ modes of conduction on the basis of 1) conduction of number of device 2) conduction of each device 3) output phase voltage (draw waveform for each case)	**04**
	(c)	Explain working of 3-ϕ A.C. voltage controller with star connected R load using circuit diagram and waveforms of input phase voltages, triggering waveforms and output R phase voltage for $\alpha=60^{\circ}$.	**07**
		OR	

Q.4	**(a)**	Derive AC voltage controller average output voltage equation.	**03**
	(b)	Explain the turn-on and turn-off characteristics of an SCR.	**04**
	(c)	Describe the working of a single phase full converter in the rectifier mode with RLE load. Derive an expression for the average output voltage in terms of source voltage and firing angle.	**07**
Q.5	**(a)**	Compare CSI and VSI.	**03**
	(b)	Explain Concept of switching voltage regulators and advantages	**04**
	(c)	Describe the working of series inverter with diagram and waveforms.	**07**
		OR	
Q.5	**(a)**	List any three industrial applications of ac voltage controller. Enumerate its merits and demerits.	**03**
	(b)	Explain working principle of Matrix converter.	**04**
	(c)	Describe the basic principle of operation of a single phase to single phase bridge type cycloconverter for continuous conduction	**07**

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