Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3151106 Date:18-05-2024

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 the basic requirements for the successful firing of SCR.	**03**
	(b)	Explain the structure and various triggering modes of operation of TRIAC.	**04**
	(c)	The half wave controlled rectifier has purely resistive load of R and delay angle $\alpha = 60^0$ determine. (i) Rectification efficiency (ii) Form factor and (iii) Ripple factor.	**07**
Q.2	**(a)**	Compare natural and forced commutations of SCR.	**03**
	(b)	Explain the various Turn-On methods of SCR in brief.	**04**
	(c)	Derive the average load voltage and load current equations of single phase half wave controlled rectifier with resistive and inductive load.	**07**
		OR	
	(c)	A dc chopper operates on 300V dc and frequency of 200 Hz, feeds an R-L load. Determine the ON times of the chopper for output voltage of 150V.	**07**
Q.3	**(a)**	Draw the schematic of step-up chopper and derive an expression for output voltage of chopper.	**03**
	(b)	Compare the Time Ratio control and current limit control strategies of chopper.	**04**
	(c)	With help of neat circuit diagram and waveforms, explain the operation of single phase half bridge voltage source inverter with resistive load.	**07**
		OR	
Q.3	**(a)**	What are the applications of chopper? Explain the working of class A chopper.	**03**
	(b)	Explain the multiphase chopper.	**04**
	(c)	With help of neat circuit diagram and waveforms, explain the operation of single phase full bridge square wave inverter with resistive load.	**07**
Q.4	**(a)**	Explain the dv/dt and di/dt ratings of SCR.	**03**
	(b)	What is commutation? Explain class D forced commutation.	**04**
	(c)	Design the basic structure of MCT and explain its turn on and turn off operations.	**07**
		OR	
Q.4	**(a)**	Explain the internal control pulse width modulation control method of inverter.	**03**
	(b)	Compare IGBT and Power MOSFET.	**04**
	(c)	Design the structure of MOSFET and explain its operation and V-I characteristics.	**07**

Q.5	**(a)**	Compare General Power supply and SMPS.	**03**
	(b)	Explain the working of fly back converter SMPS.	**04**
	(c)	With help of block diagram, explain the operation of on line UPS. List the important specifications of on line UPS.	**07**

OR

Q.5	**(a)**	What do you mean by EMI and EMC?	**03**
	(b)	Explain the working of induction motor.	**04**
	(c)	Write short note on permanent magnet stepper motor drive.	**07**

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