Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2021

Subject Code:3140915 Date:05/10/2021

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)**	Sketch switching characteristics of IGBT.	**03**
	(b)	Compare IGBT and MOSFET on the basis of a) circuit symbol b)Charge carriers c) switching frequency d) Tolerance to electrostatic discharge	**04**
	(c)	Explain working of Buck-Boost converter using circuit diagram for various modes of operation.	**07**
Q.2	**(a)**	Define THD. Enlist two effects of harmonics.	**03**
	(b)	Summarize limitations of 1- ϕ half bridge inverter.	**04**
	(c)	Explain working of Flyback converter with circuit diagram and waveforms.	**07**
		OR	
	(c)	Explain working of Forward converter with circuit diagram and waveforms.	**07**
Q.3	**(a)**	Compare unipolar sinusoidal modulation and bipolar sinusoidal modulation.	**03**
	(b)	Explain inverter mode operation of 1- ϕ bridge rectifier.	**04**
	(c)	Explain working of 3- ϕ inverter for 120° conduction mode using the gate voltage and phase voltage waveform.	**07**
		OR	
Q.3	**(a)**	Discuss SPWM technique in brief.	**03**
	(b)	Sketch circuit diagram and waveforms of V_s, I_g, V_o, I_o and V_t for 1- ϕ full bridge controlled rectifier with R-L load with free wheeling diode.	**04**
	(c)	Explain space vector modulation for 3- ϕ inverter.	**07**
Q.4	**(a)**	Enlist methods of power factor improvement for AC-DC converters.	**03**
	(b)	Explain principle of on-off control for AC voltage controller.	**04**
	(c)	Explain working of 1- ϕ dual converter.	**07**
		OR	
Q.4	**(a)**	Explain relationship between delay angle and load angle.	**03**
	(b)	Explain method to provide over voltage protection to power electronic switch.	**04**
	(c)	Derive equation of output voltage for 1- ϕ AC voltage controller with RL load.	**07**
Q.5	**(a)**	Derive equation of average and RMS voltage for 1- ϕ full bridge controlled rectifier with R load.	**03**
	(b)	Explain working principle of cycloconverter.	**04**
	(c)	Derive equation of output voltage for 1- ϕ AC voltage controller with RL load.	**07**

OR

Q.5	**(a)**	Enlist methods of SCR firing and draw circuit for any one of them.	**03**
	(b)	Explain working principle of matrix converter.	**04**
	(c)	Obtain characteristics of TRIAC. Explain working of TRIAC in 1- ϕ AC voltage controller.	**07**

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