Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV EXAMINATION – SUMMER 2020

Subject Code: 3140915 Date:04/11/2020

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.**

			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)	Explain working of 1-ϕ semi converter with the help of voltage and current waveform under resistive load.	**07**
Q.2	**(a)**	Compare the RC firing circuit and R firing circuit based on its circuit diagram.	**03**
	(b)	Describe the effect of high switching frequency on harmonics spectrum in single phase full bridge inverter.	**04**
	(c)	Derive the output voltage equation in case of buck and boost converter and draw the comparison.	**07**
		OR	
	(c)	Draw the circuit diagram of three-phase full converter connected to RL load with continuous conduction. Draw the waveforms of output voltage, output current for firing angle equal to 60°.	**07**
Q.3	**(a)**	Write application of cycloconverters.	**03**
	(b)	Write advantages and disadvantages of PWM technique to generate gate pulse.	**04**
	(c)	Draw necessary waveforms and explain working of single phase full controlled rectifier circuit with R-L load.	**07**
		OR	
Q.3	**(a)**	Justify the statement why SCR is not suitable for dc to ac converter for low power applications.	**03**
	(b)	Explain construction of Power MOSFET.	**04**
	(c)	Describe the working of a single phase full bridge inverter with relevant circuit and waveforms for R-L Load.	**07**
Q.4	**(a)**	Derive only expression of RMS output voltage of single phase full wave AC voltage controller with R load.	**03**
	(b)	Write important features of sinusoidal pulse width modulation used in PWM inverters.	**04**

	(c)	Explain working of 3 phase bridge inverter with star connected resistive load with 180˚ mode using gate signals, output phase voltage and line voltage.	**07**

OR

Q.4	**(a)**	Describe the working of freewheeling diode in Phase controlled rectifier.	**03**
	(b)	Write a short note on matrix converter.	**04**
	(c)	Explain working of 3 phase bridge inverter with star connected resistive load with 120˚ mode using gate signals, output phase voltage and line voltage.	**07**
Q.5	**(a)**	List the various voltage control techniques in DC-DC converters.	**03**
	(b)	Give four points of difference between on-off control and phase angle control.	**04**
	(c)	Explain the working principal of buck-boost converter with circuit diagram of different modes of operation.	**07**

OR

Q.5	**(a)**	Draw the output voltage waveform of three-phase half-wave controlled rectifier with the R-load.	**03**
	(b)	State at least two reasons to control or eliminate the harmonics in inverters. List out different techniques to eliminate harmonics in inverter.	**04**
	(c)	Explain the parallel operation of SCR.	**07**