Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: BE04009031 **Date: 16/06/2026**

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.**

Q.1	**(a)**	Define the term: (i) holding current (ii) latching current.	**03**
	(b)	Explain construction and static characteristics of IGBT.	**04**
	(c)	Draw and explain the resistance triggering and R-C triggering circuits for turning on SCR.	**07**
Q.2	**(a)**	What is pulse width modulation? List the various PWM techniques.	**03**
	(b)	Write a short note on (i) SiC devices (ii) GaN devices	**04**
	(c)	Draw circuit diagram and necessary waveforms of single phase fully controlled center-tapped ac to dc converter with R load. Derive equation for VRMS.	**07**
		OR	
Q.2	**(c)**	Explain three phase inverter with 120^0 mode of conduction with circuit and waveform.	**07**
Q.3	**(a)**	Explain the effect of firing angle on output voltage.	**03**
	(b)	Derive output voltage equation for single phase half wave rectifier.	**04**
	(c)	Describe three adverse effects of electromagnetic interference. Discuss briefly one remedial step to reduce EMI.	**07**
		OR	
Q.3	**(a)**	Write significance of freewheeling diode in control rectifier with necessary circuit diagram and waveforms.	**03**
	(b)	Describe the SPWM control technique in detail.	**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**
Q.4	**(a)**	What is on-off control in AC regulators?	**03**
	(b)	Classify different techniques for voltage control of inverter. Explain anyone.	**04**
	(c)	Explain the working principal of buck-boost converter with circuit diagram of different modes of operation.	**07**
		OR	
Q.4	**(a)**	Discuss the operation of DC/DC Flyback converter.	**03**
	(b)	Explain TRC and CLC control strategies with respect to DC-DC converters.	**04**

(c) Show that the fundamental rms value of per-phase output voltage of low frequency for an m pulse cyclo-converter is given by **07**

$$V_{or} = V_{ph}\left(\frac{m}{\pi}\right) sin\left(\frac{\pi}{m}\right)$$

Q.5 **(a)** Define the term Harmonics, its causes and effects. **03**

(b) Give comparison between on-off control and phase angle control. **04**

(c) Explain applications of power electronics in EV Systems. **07**

OR

Q.5 **(a)** Explain UJT relaxation oscillator circuit. **03**

(b) What is a cycloconverter? Enumerate some of its industrial applications. **04**

(c) Explain HVDC transmission using converters. **07**

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