

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-IV EXAMINATION – WINTER 2025

Subject Code:3140915

Date:01-12-2025

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) Draw the symbol of Transistor, MOSFET, IGBT, DIAC, TRIAC and GTO.	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 three adverse effects of electromagnetic interference. Discuss briefly one remedial step to reduce EMI.	07
Q.2	(a) Compare linear voltage regulator and switching voltage regulator.	03
	(b) Explain working of 2-quadrant chopper.	04
	(c) Explain working of 1- ϕ semi converter with the help of voltage and current waveform under resistive load.	07
	OR	
	(c) Explain multi-quadrant operation of DC-DC converter.	07
Q.3	(a) Explain the principle of pulse width modulation for inverter.	03
	(b) State the advantages & disadvantages of current source inverter & voltage source inverter.	04
	(c) Draw gate voltage and phase voltage waveform and explain 3 phase inverter operation for 120° conduction mode.	07
	OR	
Q.3	(a) Describe unipolar and bipolar sinusoidal pulse width modulation for inverter.	03
	(b) Describe the effect of high switching frequency on harmonics spectrum in single phase full bridge inverter.	04
	(c) Discuss Space Vector Pulse Width Modulation Technique in brief.	07
Q.4	(a) Describe the working of freewheeling diode in Phase controlled rectifier.	03
	(b) Draw circuit of 1- ϕ half wave-controlled rectifier with R load. Draw waveforms for input voltage, output voltage and voltage at $\alpha=30^\circ$.	04
	(c) Explain working of 1- ϕ semi converter with the help of voltage and current waveform under resistive load.	07
	OR	
Q.4	(a) Derive output voltage equation for single phase full wave rectifier	03

(b) Discuss about Midpoint CycloConverter in brief. **04**

(c) Describe three phase full wave-controlled AC –DC converter with R load with circuit and waveform. **07**

Q.5 (a) Give four points of difference between on-off control and phase angle control. **03**

(b) Write a short note on matrix converter. **04**

(c) Explain working of 1- ϕ to 1- ϕ cycloconverter with input frequency 50Hz and output frequency 10Hz. **07**

OR

Q.5 (a) List any three industrial applications of ac voltage controller. Enumerate its merits and demerits. **03**

(b) Describe briefly three adverse effects of electromagnetic interference. Discuss briefly one remedial step to reduce EMI. **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**

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