

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3140915**Date:11-07-2022****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.

	MARKS
Q.1 (a) Draw circuit of 1- ϕ half wave controlled rectifier with R load. Draw waveforms for input voltage, trigger pulses at $\alpha=30^\circ$, output voltage and voltage across the switching device.	03
(b) Explain forward blocking and forward conduction mode of operation for SCR using sketch of SCR forward V-I characteristics.	04
(c) Explain operation of IGBT using sectional view.	07
Q.2 (a) What is buck regulator? Draw circuit diagram and waveforms for voltage across freewheeling diode, current through inductor.	03
(b) Explain working of 2-quadrant chopper.	04
(c) Explain working of half bridge inverter with R-L load using circuit diagram and waveforms of triggering signal, output voltage, output current, voltage across switch and voltage across diode.	07
OR	
(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.3 (a) Describe positions of space vector on the basis of switching states.	03
(b) For boost regulator, derive the formula of rise time and fall time of inductor current. Also derive the formula of output voltage.	04
(c) Explain cause of presence of harmonics in output of inverter. Explain 4 effects of switching frequency on harmonic spectrum.	07
OR	
Q.3 (a) Enlist control techniques for output voltage control of switching regulators. Explain briefly any one of them.	03
(b) Describe unipolar and bipolar sinusoidal pulse width modulation for inverter.	04
(c) Derive the expression for RMS value of output voltage for 1- ϕ full wave bi-directional controller. Find RMS value of output voltage for 230V ac input with $\alpha=45^\circ$.	07
Q.4 (a) Enlist power factor improvement techniques for AC-DC converter. Explain briefly any one of them.	03
(b) Explain the principle of pulse width modulation for inverter.	04
(c) Analyze briefly 7 technical parameters required for selection of power electronic switch.	07

OR

- Q.4** (a) Derive an expression for average value of output voltage for 1- ϕ half wave controlled rectifier with RL load. **03**
(b) Determine four applications of inverters in power system. **04**
(c) Determine 7 important parameters which can be derived from datasheet of SCR. **07**

- Q.5** (a) Compare 120° and 180° modes of conduction on the basis of 1) conduction of number of device 2) conduction of each device 3) output phase voltage (draw waveform for each case) **03**
(b) Describe briefly three adverse effects of electromagnetic interference. Discuss briefly one remedial step to reduce EMI. **04**
(c) Explain working of 1- ϕ current source inverter with necessary waveforms. **07**

OR

- Q.5** (a) Enlist 3 applications of DC-DC converter. **03**
(b) The single phase half bridge inverter has the Dc input of 100V. The load resistance is 10 Ω . Determine 1) RMS value of output voltage 2) The fundamental component of RMS value **04**
(c) Explain working of 1- ϕ to 1- ϕ cycloconverter with input frequency 50Hz and output frequency 10Hz. **07**
