Total number of printed pages: 2 **UG/6th Semester/UECE616 (B)**

2024

POWER ELECTRONICS

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What are the types of power diodes? What are the main difference between power diodes and Schottky diode?	2+3=5
	b)	Define latching current. Describe the different modes of operation of a thyristor with the help of its static I-V characteristics.	2+6=8
	c)	Describe the operation of two-transistor model of a thyristor.	7
2.	a)	What is a controlled rectifier? A single-phase half-wave SCR circuit feeds power to a resistive load. Explain and derive the expression for average dc output voltage, load current and power factor. Draw the relevant waveforms.	2+8=10
	b)	A single-phase one-pulse SCR-controlled converter feeds an RL load with a freewheeling diode across the load. Discuss how the freewheeling diode comes into play when the supply voltage passes through zero and becomes negative. Sketch waveforms for supply and load current, freewheeling diode current, and the voltage across the SCR.	6+4=10
3.	a)	Snubber circuit for an SCR should primarily consist of capacitor only. But, in actual practice, a resistor is used in series with the capacitor. Discuss briefly.	6
	b)	What is an inverter? A single phase full bridge inverter has a resistive load of R = 10 Ω and the input voltage Vdc of 100 V. Find the average output voltage and rms output voltage at fundamental frequency.	2+4=6
	c)	What are the performance parameters that are used to evaluate the quality of inverters? What is the purpose of connecting diodes in antiparallel with thyristors in inverter circuit? Explain how these diodes come into play.	2+2+4=8
4.		Explain the operation of a 3-phase bridge inverter for a 180-degree mode of operation with aid of relevant phase and line voltage waveforms. A three-phase bridge inverter delivers power to a resistive load from a 420 V_{dc} source. For a star-connected load of 100 Ω per phase, determine for 180-degree conduction: (i) Voltage for each mode (ii) current for each mode.	12+8=20

5.	a)	What are the normal specifications of power supplies? What is the general arrangement of UPS system? List the various types of regulated power supply.	4+3+3=10
	b)	Describe the Buck and Boost switching regulators with relevant equivalent circuits and waveforms.	5+5=10
6.	a)	What is UPS? Describe briefly Online and Offline UPS.	2+10=12
	b)	Which one to use, Online or Offline UPS and Why? Prepare a comparison table in between Online and Offline UPS.	4+4=8