Code: 20EE3502

III B.Tech - I Semester – Regular Examinations - DECEMBER 2022

POWER ELECTRONICS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours　　　　　　　　　Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
　　　2. All parts of Question must be answered in one place.

BL – Blooms Level　　　　　　　　　CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	From the switching (or dynamic) characteristics, how would you compare the turn-on and turn-off process of IGBT?	L4	CO4	7 M
	b)	Illustrate the static VI characteristics of SCR with necessary circuit diagram and waveforms.	L3	CO2	7 M
		OR			
2	a)	How would you compare various types of Power Diodes with applications?	L4	CO4	7 M
	b)	Demonstrate the two transistor analogy of SCR with relevant diagram and equations.	L3	CO2	7 M
		UNIT-II			
3	a)	Describe the working principle of single-phase full wave fully-controlled bridge converter in the following two-modes (i) Rectifying mode (ii) Inversion mode.	L4	CO4	7 M
	b)	A 3-phase full-wave fully controlled converter is operates from a 3-phase star	L3	CO2	7 M

		connected 240V/50 Hz supply and the load resistance is R=20 Ω. If it is required to obtain an average output voltage of 70% of the maximum possible output voltage determine (i)Firing angle and (ii) average value of output current .			

<div align="center">OR</div>

4	a)	How would you explain with neat sketch single phase half wave controlled rectifier with R load and also derive the average output voltage equation, output current equation and also input power factor?	L4	CO4	7 M
	b)	A 3-phase full-wave fully controlled converter is operates from a 3-phase star connected 208V/50 Hz supply and the load resistance is R=10 Ω. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage determine, firing angle, RMS and average value of output currents.	L3	CO2	7 M

<div align="center">UNIT-III</div>

5	a)	How would you explain 3-phase bridge inverter operation with 120 degrees conduction mode?	L4	CO5	7 M
	b)	A three-phase bridge inverter delivers power to a resistive load from a 450V dc source. For a star-connected load of 10Ω per phase, determine the RMS value of load current for both conduction of (i)180^0 mode and (ii) 120^0 mode.	L3	CO3	7 M

<div align="center">OR</div>

6	a)	What is pulse width modulated inverter? What are different Pulse-Width Modulation (PWM) techniques used in inverter? Explain any one Pulse-Width Modulation (PWM) technique.	L4	CO5	7 M
	b)	Construct the Cascaded H bridge multilevel inverter with relevant switching activity.	L3	CO3	7 M

UNIT-IV

7	a)	With a neat sketch, explain the working principle and operation of four quadrant chopper.	L4	CO4	7 M
	b)	A buck-boost converter has input voltage of 24 V and it operates at 30Khz.When the duty cycle is 0.4, L=500μH, C=147μF and average load current is 1A, determine the average output voltage and peak to peak ripple current through the inductor.	L3	CO2	7 M

OR

8	a)	Explain the operation of Buck converter with circuit and waveforms.	L4	CO4	7 M
	b)	A DC-DC buck converter operates in continuous conduction mode. It has 48 V input voltage and it feeds a resistive load of 24 Ω. The switching frequency of the converter is 250 Hz. If switch-on duration is 1 ms, determine the load power.	L3	CO2	7 M

UNIT-V

9	a)	For a 1-phase full wave AC voltage controller feeding a resistive load, draw the waveforms of source voltage, gating signals, output voltage and voltage across the SCR. Describe the working with reference to waveforms drawn.	L4	CO5	7 M

	b)	Construct and explain the operation of step down cycloconverter with necessary circuit diagram and waveforms.	L3	CO3	7 M
		OR			
10	a)	Draw the output voltage wave form of step up 1-Φ to 1-Φ midpoint cycloconverter for $f_{in}=f_o/6$ and α=30˚. Assume that load is R.	L4	CO5	7 M
	b)	A single-phase ac voltage controller has a resistive load of 20 ohms. The input voltage is 220V rms at 50Hz. The delay angle of thyristors is α=40°. Calculate (i) rms load voltage, (ii) power consumed.	L3	CO3	7 M