MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

MLRS

III B. Tech I Sem Supply End Examination, December 2022
Power Electronics
(EEE)

Time: 3 Hours.   **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
       2. In Part – A, answer all questions which carries 20 marks.
       3. In Part – B, answer any one question from each unit.
          Each question carries 10 marks and may have a, b as sub questions.

PART- A
(10*2 Marks = 20 Marks)

1. a)	Draw the characteristics of an Ideal and Practical semiconductor switch.	2M	CO1	BL-5
b)	List out the different types of power electronic converters.	2M	CO1	BL-6
c)	Differentiate between uncontrolled and controlled rectifiers.	2M	CO2	BL-3
d)	What is the effect of free-wheeling diode on a phase-controlled rectifier with inductive load?	2M	CO2	BL-1
e)	Draw the circuit diagram of Buck-boost Converter.	2M	CO3	BL-2
f)	Define duty-ratio of a power electronic converter. Write the minimum and maximum values of it.	2M	CO3	BL-4
g)	Draw the circuit diagram of a single-phase half-bridge inverter.	2M	CO4	BL-3
h)	Write about the importance of PWM techniques.	2M	CO4	BL-5
i)	Differentiate between cycloconverters and AC voltage regulators.	2M	CO5	BL-2
j)	Write the applications of AC voltage regulators.	2M	CO5	BL-1

PART- B
(10*5 Marks = 50 Marks)

2 a)	Explain the construction and operation of depletion type MOSFET. Also draw its transfer and output characteristics to both the depletion and enhancement modes of operation.	5M	CO1	BL-5
b)	Compare the differences between SCR, MOSFET and IGBT.	5M	CO1	BL-2

OR

3 a)	Explain the construction and operation of thyristor in different modes along with its I-V characteristics.	5M	CO1	BL-3
b)	List out the any three applications of different types of power electronic converters.	5M	CO1	BL-4

4 a)	Describe the operation of single-phase fully controlled bridge converter with R-L load and derive the expression to RMS value of output voltage.	5M	CO2	BL-2
b)	Draw the circuit diagrams of single-phase and three-phase dual converters.	5M	CO2	BL-5

OR

5	a)	Describe the operation of three-phase fully controlled bridge converter with R-load.	5M	CO2	BL-3
	b)	A single-phase half-wave-controlled rectifier with R-load is fed from a 220 V, 50 Hz AC supply. When R = 10 Ω and α= 45°, determine (a) average dc output voltage, and (b) rms output voltage.	5M	CO2	BL-4
6	a)	Explain the operation of Boost converter and derive the expression for critical value of inductor.	5M	CO3	BL-2
	b)	A Buck converter has 15V input and 6V output voltage operated at 20kHz, R_L=100 ohms and peak-peak output ripple voltage is 20mV and peak-peak ripple current is 0.75A. Determine filter inductance, filter capacitance and critical values of L & C.	5M	CO3	BL-4

OR

7	a)	Explain the operation of Buck converter and derive the expression for critical value of capacitor.	5M	CO3	BL-3
	b)	A buck-boost converter has input voltage of 24 V and it operates at 30 kHz. When the duty cycle is 0.4, L = 500 mH, C = 147 mF and average load current is 1 A, determine the average output voltage, peak to peak ripple current through inductor.	5M	CO3	BL-4
8	a)	Analyze the operation of a 3-phase inverter with 180-degree mode of operation with neat schematics.	5M	CO4	BL-5
	b)	Describe the operation of single-phase bridge converter with R-L load.	5M	CO4	BL-2

OR

9	a)	Analyze the operation of a 3-phase inverter with 120-degree mode of operation with neat schematics.	5M	CO4	BL-3
	b)	Describe sinusoidal PWM control of single phase VSI with the help of suitable waveform.	5M	CO4	BL-4
10	a)	Discuss the methods of voltage control employed in AC voltage controllers with necessary waveforms	5M	CO5	BL-2
	b)	A single-phase half-wave AC voltage controller is connected with a load of R = 10 Ω with an input voltage of 220 V, 50 Hz. When the firing angle of thyristor is 30°, find the RMS output voltage, power output at load and average value of output voltage.	5M	CO5	BL-4

OR

11	a)	Illustrate the principle of working of a 1-phase to 1-phase bridge type step down cycloconverter feeding an R load.	5M	CO5	BL-2
	b)	A single-phase bridge cycloconverter is fed from 220 V, 50 Hz ac supply and a load of 20 Ω is connected with the cycloconverter. The frequency of output voltage is half of the input frequency. If the firing angle α = 90°, determine (a) rms value of output voltage, (b) rms value of load current.	5M	CO5	BL-4

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CO - Course Outcome   **BL - Blooms Taxonomy Levels**