PVP 23

Code: 23EE3501

III B.Tech - I Semester - Regular Examinations - NOVEMBER 2025

POWER ELECTRONCIS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1. a)	What are the advantages of UJT firing circuit?	L2	CO1
b)	Draw circuit symbols of SCR and MOSFET.	L1	CO1
c)	Write applications of phase controlled converters.	L2	CO3
d)	Interpret the significance of circulating current mode in dual converter operation.	L3	CO3
e)	Illustrate the reason why ripple content is very less in three phase rectifier circuits.	L3	CO3
f)	What is cyclo-converter and write its classification?	L1	CO1
g)	Write applications of choppers.	L2	CO3
h)	What is current limit control of a chopper?	L2	CO5
i)	What are the applications of inverters?	L2	CO4
j)	Demonstrate the advantages with PWM control in the inverters.	L3	CO5

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Analyze and draw steady state characteristics of SCR.	L4	CO1	5 M
	b)	Draw and explain switching characteristics of SCR.	L3	CO1	5 M
OR					
3	a)	Demonstrate the RC triggering circuit for SCR.	L3	CO1	5 M
	b)	Write detailed comparison between MOSFET and IGBT.	L3	CO1	5 M
UNIT-II					
4	a)	A single Phase fully controlled converter is operated from a 220V, 50Hz supply. The load current is 10A continuous with negligible ripple content. The delay angle of Thyristor is 30^0. Determine. a) Input displacement factor, b) Input power factor, c) Output DC voltage, d) Output RMS voltage, e) Input distortion factor, f) Input harmonic factor.	L4	CO4	10 M
OR					
5	a)	Explain the working operation of a single phase half controlled bridge converter with resistive load and draw output voltage waveforms. Also derive output voltage expression.	L4	CO3	6 M
	b)	A single phase half controlled bridge rectifier supplies a resistive load. Assume that the transformer secondary voltage is	L4	CO4	4 M

		15V and load is 0.013 ohms. Neglecting transformer leakage and device voltage drops. Find the rectifier average value of the load voltage and current when firing angle is 90^o.			
UNIT-III					
6	a)	Analyze the performance of a three phase half-wave mid-point converter operating with RL load and draw output voltage waveforms.	L4	CO3	6 M
	b)	Derive the output voltage expression for the three phase half-wave mid-point converter operating with RL load.	L4	CO3	4 M
OR					
7	a)	Describe the operating principle of midpoint type step down cyclo-converter with related wave forms for output frequency of $f_s/4$ in continuous and discontinuous conductions modes of operation.	L4	CO4	6 M
	b)	List out applications of cyclo-converters.	L3	CO4	4 M
UNIT-IV					
8	a)	Explain the operation of buck converter with neat waveforms.	L4	CO3	5 M
	b)	The buck regulator has input voltage of 12V DC. The required average output voltage is 5V for R Load of 500Ω and peak to peak output ripple voltage is 20mV. The switching frequency is 25KHZ. If the peak to peak ripple current of inductor is 0.8A. Determine duty cycle k, Required value of inductor (L) and capacitor(C).	L4	CO4	5 M

OR					
9		The buck-boost regulator has input voltage of 12V DC. The duty cycle is 0.25 and switching frequency is 25KHz. The inductance is 150 µH and filter capacitance is 220 µF. The average load current is 1.25A. Determine : a) average output voltage, b) peak to peak output ripple voltage, c) peak to peak ripple current of inductor, d) Critical value of inductor, e) critical value of capacitor.	L4	CO4	10 M
UNIT-V					
10	a)	Describe current source inverter with the help of circuit diagram and waveforms.	L4	CO3	5 M
	b)	Explain about unipolar and bipolar PWM methods.	L4	CO5	5 M
OR					
11	a)	Analyze the performance of three phase inverter with 180^{o} conduction mode of operation for star connected load and derive output voltage expression.	L4	CO4	6 M
	b)	A Single phase full bridge inverter is fed from a 500Volts DC source, it is supplying a purely resistive load of 100 Ω. Determine the RMS value of the output voltage and current.	L4	CO4	4 M