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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. III Year I Semester Regular Examinations December-2025

POWER ELECTRONICS

(Electrical and Electronics Engineering)

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

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define latching current and holding current of a thyristor.	CO1	L1	2M
	b	Differentiate between MOSFET and IGBT.	CO1	L1	2M
	c	Write the average output voltage equation of a buck converter.	CO3	L1	2M
	d	Mention two applications of buck–boost converters.	CO3	L1	2M
	e	Define duty ratio in a DC–DC converter.	CO3	L1	2M
	f	Write the average output voltage equation of a buck converter.	CO3	L1	2M
	g	List the types of PWM techniques used in inverters.	CO4	L1	2M
	h	State the principle of operation of a parallel inverter	CO4	L1	2M
	i	Derive the RMS load voltage expression for a single-phase AC voltage controller with R load.	CO5	L2	2M
	j	Define the integral cycle control.	CO6	L1	2M

PART-B

(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2		Draw and explain the I–V characteristics of a thyristor with neat diagram	CO1	L2	10M
		OR			
3		Draw and explain current commutation of a Thyristor.	CO1	L2	10M

UNIT-II

4		A single Phase fully controlled converter supplies an inductive load. Assuming load current is constant=10A.Determine the following quantities if supply voltage is 230V, 50 Hz and α=40. Calculate the i) Average Output Voltage of converter, ii) Supply RMS Current, iii) Supply Fundamental RMS Current, iv) Fundamental Power factor, v) Supply Power Factor, vi) Supply harmonic factor.	CO2	L3	10M
		OR			
5		With circuit and waveforms, explain a Single-Phase Full Bridge Thyristor rectifier with RL loads for Discontinuous Conduction Mode, also derives the average and RMS load voltage. α=90°	CO2	L2	10M

UNIT-III

6		With average voltage & current, explain the working principle of a boost converter.	CO3	L2	10M
		OR			
7		A DC chopper is connected to a 100V DC source supplies an inductive load having 40 mh in series with a resistance of 5ohms. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper.	CO3	L3	10M

UNIT-IV

8		Explain the operation of a single-phase VSI with R-load.	CO4	L2	10M
		OR			
9		Illustrate the operation of a three-phase Voltage Source Inverter (VSI) operating in 120° conduction mode. With a neat circuit diagram, voltage and current waveforms, describe the sequence of switching and output phase voltage.	CO4	L4	10M

UNIT-V

10		The single phase full wave AC voltage controller has a resistive load of R=5Ω & the input voltage VS=120V(RMS), 50Hz. The delay angles of thyristors T1 &T2 are equal i.e., α1=α2=2π/3. Determine (i) The RMS output voltage (ii) Input power factor (iii) Average current of thyristor (iv) The RMS current of thyristor.	CO5	L3	10M
		OR			
11		Illustrate the principle of operation of single-phase to single-phase Bridge type step-down cycloconverter with a Resistive Load.	CO5	L4	10M

*** END ***