O.P.Code: 25EE2101	R25	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

M.Tech I Year I Semester Regular Examinations January-2026

SWITCHED MODE POWER CONVERTERS

(Power Electronics)

Time: 3 Hours **Max. Marks: 60**

(Answer all Five Units **5 x 12 = 60** Marks)

		UNIT-I			
1	a	Explain the basic operation of a Buck switching regulator with the help of a neat circuit diagram and waveform.	CO1	L1	6M
	b	A Buck converter steps down 24V to 12V at a load current of 2A. Determine the duty cycle,average inductive current, and peak-to-peak inductive current for a switching frequency of 25kHz with L=200μH.	CO1	L3	6M
		OR			
2	a	Discuss the manjor factors affecting buck regulator efficiency. Explain conductionandswitchinglosses.	CO1	L3	6M
	b	A Buck regulator has an input of 20V,output of 10V,and output current of 5A. If the diode drop is 0.7V and transistor saturation voltage is 0.3 V, calculate the efficiency.	CO1	L4	6M
		UNIT-II			
3	a	Describe the concept of master–slave outputs in Push-Pull converters and Explain how multiple secondary windings affect load regulation.	CO2	L4	6M
	b	A Push-Pull converter provides two outputs :5V/3A and 12V/1A, input voltage =36V, dutycycle = 0.45. Design the secondary turns required for each output.	CO2	L3	6M
		OR			
4	a	Explain the basic operation of a Forward converter with neat wave forms and Discuss role of magnetizing current, free wheeling path, and reset winding.	CO2	L2	6M
	b	A forward converter has: Vin=24V, Np: Ns = 1:0.5, dutycycl e=0.4, Load = 10Ω. Determine: (i). Output voltage (ii). Average inductor current	CO2	L3	6M
		UNIT-III			
5	a	Explain the sequence of switching and mid point voltage formation in a Half-Bridge converter and Discuss how the two series capacitors maintain voltage balance.	CO3	L2	6M
	b	A Half-Bridge converter operates from 350 V DC. Output required = 28 V, duty cycle = 0.42. Determine the ideal transformer turns ratio and the primary applied volt seconds during the ON interval.	CO3	L3	6M
		OR			
6	a	Explain the basi coperation of a Full-Bridge converter and discuss how all four switches contribute to transferring power to the transformer.	CO3	L2	6M
	b	A Full-Bridge converter operates with : Input = 300 V, Duty = 0.48, Transformer ratio = 8:2. Find the secondary voltage during the active interval and maximum ideal output voltage.	CO3	L3	6M
		UNIT-IV			
7	a	Derive the expression for output voltage of a DCM Flyback converter in in termsofinputvoltage,dutycycle,load,andtransformerturnsratio.	CO4	L3	6M
	b	A DCM Flyback converter operates from 24V input, delivers 5V at 2A, with Np: Ns = 1:4 and D=0.33. Calculate the peak primary current and energy stored in magnetizing inductance.	CO4	L3	6M

OR

8	a	Describe the operation of Continuous Conduction Mode (CCM) Flyback converters with magnetizing current waveforms.	CO4	L2	6M
	b	For a CCM fly back operating from 18–36V input, delivering 12V, 5A output,with Np:Ns=3:1 and D=0.4at Vin(min), calculate the average and peak magnetizing currents.	CO4	L3	6M

UNIT-V

9	a	Define the deficiencies of voltage-fedPWMfull-bridge converters for circulatingcurrent,transformersaturation,cross-conduction.	CO5	L1	6M
	b	A PWM full-bridge converter operates from a300V DC bus at duty cycle 0.48.Calculate the effective primary voltage applied during the active interval.	CO5	L3	6M

OR

10	a	List the advantages and drawbacks of a buck voltage-fed full-bridge topology with respect to switch stress, transformer utilization, and EMI.	CO5	L1	6M
	b	A buck voltage- fed full-bridge has input=220V and produces a 55V output at 8A with 92% efficiency. Calculate input current and input power.	CO5	L3	6M

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