QP Code: R252B074 | Reg. No | | | | | | | | | | | AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M. Tech.(Second Semester) Examinations, July - 2025

24MPEPE12001– Switched Mode and Resonant Converters

(Power Electronics)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	What distinguishes flyback and push-pull converter topologies from each other?	CO1	K2
b.	Discuss the typical limitations associated with basic series resonant inverters.	CO1	K2
c.	What are the different types of load resonant converters?	CO2	K1
d.	Define DPF and THD and explain their significance briefly.	CO3	K1
e.	List the advantages of SMPS over factor-controlled rectifiers.	CO4	K3

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2.a	Explain how switching power converters introduce power line disturbances and their impact on power quality.	5	CO1	K2
2.b	Design a Buck-Boost converter with: Vin = 24V, D = 0.4, R = 5Ω, L = 20μH, C = 80μF. Find V_{out}, average/max/min inductor current, and voltage ripple at 100 kHz switching freq.	5	CO1	K3
	(OR)			
2.c	Compare flyback and push-pull converters based on isolation, voltage gain, and transformer configuration.	5	CO1	K2
2.d	Explain the working of a push-pull converter with a neat diagram, showing switching and output waveforms.	5	CO1	K4
3.a	Illustrate how Zero Voltage Switching (ZVS) reduces switching losses in a DC-DC converter with relevant voltage and current waveforms.	5	CO2	K3
3.b	Describe the internal modeling of a PWM controller with schematic and waveform explanation.	5	CO2	K2
	(OR)			
3.c	Differentiate unidirectional and bidirectional core excitation in isolated converters. Give examples and describe behavior during switching.	5	CO2	K4
3.d	Derive the small-signal AC equivalent model for a flyback converter considering parasitic elements.	5	CO2	K2
4.a	Describe bipolar and unipolar PWM techniques used in full-bridge converters. Include timing waveforms and compare their advantages.	5	CO3	K3
4.b	Explain the working of a series load resonant converter when the switching frequency fs < 0.5fo, and sketch the inductor current and capacitor voltage waveforms.	5	CO3	K3
	(OR)			
4.c	Discuss the design and application benefits of series resonant inverters for induction heating.	5	CO3	K4

4.d	Explain how the B-H curve of an inductor used in SMPS can be measured and interpreted for design decisions.	5	CO3	K3
5.a	Define THD and DPF. Explain their importance in analyzing output quality in SMPS and resonant converters.	5	CO4	K1
5.b	Describe the operation of a quasi-resonant boost converter with Zero Current Switching (ZCS) and illustrate its waveforms.	5	CO4	K4
	(OR)			
5.c	Derive expressions for inductor current and output voltage during discontinuous conduction mode (DCM) in a buck converter.	5	CO4	K4
5.d	Explain the operation of a 3-phase PWM inverter and discuss how blanking time affects the output voltage waveform.	5	CO4	K3
6.a	Discuss key design parameters for magnetic transformers used in SMPS, including winding ratios, core material, and leakage inductance.	5	CO4	K3
6.b	List and explain advantages of Switched Mode Power Supplies (SMPS) compared to conventional linear and phase-controlled rectifiers.	5	CO4	K3
	(OR)			
6.c	Describe voltage-mode control strategy in SMPS with block diagram and explain its effect on output voltage regulation.	5	CO4	K2
6.d	What are isolated DC-DC converters? Discuss their applications and roles in telecom and embedded systems power architecture.	5	CO4	K4

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