QP Code: R262B031 | Reg. No | | | | | | | | | | | AY 25

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (Second Semester - Regular) Examinations, May – 2026

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. Can you elaborate on the concept of voltage mode control in switch mode power supplies (SMPS)?	CO1	K1
b. Highlight the various functions and applications of isolated DC converters in power electronics.	CO2	K3
c. What are the purposes of power conditioners in power systems?	CO3	K1
d. How do you select the appropriate inductor for a buck converter, considering factors such as input voltage and current requirements?	CO4	K2
e. What do ZVS and ZCS abbreviations stand for in power electronics?	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Compare flyback and push-pull converters based on isolation, voltage gain, and transformer configuration.	5	CO1	K3
b. Explain the working of a push-pull converter with a neat diagram, showing switching and output waveforms	5	CO1	K2
(OR)			
c. Describe bipolar and unipolar PWM techniques used in full-bridge converters. Include timing waveforms and compare their advantages.	5	CO1	K3
d. 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	CO1	K2
3.a. Discuss the design and application benefits of series resonant inverters for induction heating.	5	CO2	K3
b. Explain how the B-H curve of an inductor used in SMPS can be measured and interpreted for design decisions	5	CO2	K2
(OR)			
c. Discuss key design parameters for magnetic transformers used in SMPS, including winding ratios, core material, and leakage inductance.	5	CO2	K3
d. List and explain advantages of Switched Mode Power Supplies (SMPS) compared to conventional linear and phase-controlled rectifiers.	5	CO2	K4
4.a. Describe the slope compensation technique in current-mode controlled converters and explain its role in preventing subharmonic oscillations.	5	CO3	K2
b. Explain current-mode control in SMPS with a block diagram and discuss its advantages over voltage-mode control.	5	CO3	K2
(OR)			

c.	Develop the control-to-output transfer function of a Buck converter using averaged state-space modeling.	5	CO3	K3
d.	Compare voltage-mode and current-mode control strategies in SMPS with block diagrams and discuss their impact on stability and transient response.	5	CO3	K3
5.a.	A Buck-Boost converter has Vin = 24 V, Vout = -12 V, Load = 6 Ω, fs = 100 kHz. Calculate duty ratio, average inductor current, and peak current.	5	CO4	K4
b.	Explain the role of feedback compensation techniques like Type II and Type III compensators in SMPS design.	5	CO4	K3
	(OR)			
c.	Explain the design considerations of output filter capacitors in SMPS and discuss the effects of ESR and ripple current rating on converter performance.	5	CO4	K2
d.	What are the main EMI issues in SMPS? Suggest layout and filtering techniques used to minimize EMI.	5	CO4	K3
6.a.	Explain how THD and Power Factor are affected in converters without proper input current shaping. Suggest methods to improve them.	5	CO5	K2
b.	With neat waveform sketches, explain how dead-time in PWM inverters affects voltage output and causes distortion.	5	CO5	K2
	(OR)			
c.	Compare soft-switching techniques (ZVS, ZCS) in terms of switching loss, voltage/current stress, and EMI reduction.	5	CO5	K3
d.	Explain with circuit and waveforms the operation of an interleaved buck converter and its advantages in high-current low-voltage applications.	5	CO5	K2

--- End of Paper ---