QP Code: R261B021 | Reg. No | | | | | | | | | | | AY 24

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

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

24MPEPC12002– Digital Control of Power Electronic and Drive Systems

Time: 3hrs | 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. Define the term "Circuit Turn Off Time."	CO1	K1
b. Provide two practical applications where numerical methods are commonly used in problem-solving and analysis	CO2	K3
c. Explain the necessity of a snubber circuit in electronic circuits.	CO3	K2
d. What is the relation between α and β?	CO4	K3
e. What are the different components involved in simulating a bridge rectifier circuit with an R-load?	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the key advantages and limitations of using numerical methods to analyze transient behavior in DC circuits.	5	CO1	K2
b. Explain the modeling techniques for MOSFETs in switching applications during simulation.	5	CO1	K2
(OR)			
c. Describe how state-space analysis enhances the modeling of synchronous machines in dynamic simulations.	5	CO1	K3
d. Evaluate the simulation challenges of converter-fed DC motor drives under varying operational conditions.	5	CO1	K4
3.a. Simulate the closed-loop speed control of DC motors and discuss its stability aspects.	5	CO2	K4
b. Explain the relevance of base/gate drive circuits in simulation and analyze their impact on power device control.	5	CO2	K2
(OR)			
c. Explain the modeling and simulation of snubber circuits used for protecting power semiconductor devices during switching transients.	5	CO2	K2
d. Discuss how voltage-controlled thyristor choppers are simulated and their effectiveness in voltage regulation.	5	CO2	K4
4.a. Explain the significance of isolation techniques in gate drive signal simulation.	5	CO3	K2
b. Discuss the effect of switching frequency on converter performance, efficiency, and output ripple in power electronic simulations.	5	CO3	K4
(OR)			
c. Why is modeling essential for understanding the behavior of specific electrical or electronic circuits?	5	CO3	K3

d.	Describe the simulation steps of a three-phase inverter using IGBTs with a purely resistive load.	5	CO3	K3
5.a.	How are R-L-C circuits modeled to capture both transient and steady-state behavior in simulation environments?	5	CO4	K4
b.	Describe the modeling of R-L load behavior in controlled rectifier circuits and explain its effect on output voltage and current waveforms.	5	CO4	K2
	(OR)			
c.	Discuss the space vector representation in a 6-pulse inverter operating with a resistive load and its simulation aspects.	5	CO4	K3
d.	How are SCRs and TRIACs modeled in circuit simulation tools, and what real-world considerations affect their accuracy?	5	CO4	K2
6.a.	Explain how pulse-width modulation (PWM) is applied in voltage control scenarios and its benefits in converter simulations.	5	CO5	K2
b.	What makes IGBT devices widely adopted in power electronics applications? Explain with reference to their modeling and switching features.	5	CO5	K2
	(OR)			
c.	Explain the design and simulation of closed-loop voltage control for a DC-DC converter using a PI controller..	5	CO5	K2
d.	Analyze the challenges and strategies in simulating inverter circuits using space vector modulation (SVM).	5	CO5	K4

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