QP Code: R252B053 | Reg. No | | | | | | | | | | | AY 24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

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

24MPEPC12001 – POWER ELECTRONIC 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 is the role of continuous gating signals in ensuring proper operation of power electronic devices?	CO4	K2
b	Identify common real-world uses of AC voltage controllers in industrial and domestic settings.	CO2	K2
c	List the key differences between 180° and 120° conduction modes in three-phase inverters.	CO1	K2
d	How do you calculate the peak-to-peak voltage if the signal has a maximum of 1 V and a minimum of -1 V?	CO3	K3
e	Define input power factor in controlled rectifier circuits and explain its significance.	CO3	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2.a	Calculate the chopping frequency of a step-up chopper with 150V input and 450V output, if the thyristor conducts for 150μs.	5	CO3	K4
2.b	Describe the principle and application of a resonant converter in high-frequency power conversion systems.	5	CO2	K3
	(OR)			
2.c	Explain the working of a single-phase AC voltage controller connected to a purely resistive load with waveform illustrations.	5	CO1	K3
2.d	List real-world applications of cyclo-converters and explain how they help in variable frequency control.	5	CO2	K2
3.a	Analyze the use of Space Vector PWM (SVPWM) in inverters and compare its advantages with sinusoidal PWM.	5	CO3	K3
3.b	Describe the operation of a dual converter used in reversible DC motor drives and explain the control technique.	5	CO4	K3
	(OR)			
3.c	Derive the expression for RMS output voltage in a full-wave rectifier with resistive load and discuss its waveform.	5	CO1	K4
3.d	Suggest suitable snubber circuits for protecting power devices and explain their working.	5	CO2	K3
4.a	Illustrate the working of a boost converter with waveforms and explain the conditions for continuous conduction mode.	5	CO1	K3
4.b	Explain how three-phase fully controlled bridge rectifiers behave under inductive load conditions with waveform support.	5	CO2	K4
	(OR)			
4.c	Describe the differences between current source inverters and voltage source inverters with their advantages and applications.	5	CO4	K3

4.d	Compare the performance of buck, boost, and buck-boost converters in terms of efficiency, voltage gain, and duty cycle.	5	CO3	K4
5.a	Analyze the working of a Cuk converter and provide waveforms for voltage and current in continuous mode.	5	CO3	K4
5.b	Explain the concept of soft switching and its importance in reducing losses in high-frequency converters.	5	CO1	K3
	(OR)			
5.c	Derive the expression for average output voltage of a three-phase half-controlled converter feeding a resistive load.	5	CO4	K4
5.d	Discuss the role of isolation transformers in power electronic circuits and how they ensure safety and functionality.	5	CO2	K3
6.a	Highlight the advantages of using 180-degree conduction mode over 120-degree mode in three-phase inverters.	5	CO1	K2
6.b	Describe the function of a phase-shifted full-bridge converter and how it achieves ZVS operation.	5	CO4	K4
	(OR)			
6.c	Define the term "input power factor" in rectifiers and describe methods for its improvement in industrial systems.	5	CO3	K2
6.d	What criteria must be considered when selecting semiconductor devices (SCRs, MOSFETs, IGBTs) for specific converter applications?	5	CO1	K3

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