QP Code: RM23MTECH093 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May-2024

MPEPC2010 – Power Electronic Converters

(Power Electronics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

		CO#	Blooms Level
a.	Explain the continuous gating signal's significance in power electronics.	CO4	K2
b.	Discuss the practical applications where AC voltage controllers are commonly used.	CO2	K2
c.	Describe the advantages of a single-phase bridge converter compared to a mid-point converter.	CO1	K2
d.	Recall the formula for calculating the output voltage in a Buck converter.	CO4	K1
e.	Differentiate between 180-degree and 120-degree conduction in three-phase inverters.	CO1	K2
f.	Interpret the importance of peak-to-peak voltage in AC signals.	CO2	K4
g.	Calculate the peak-to-peak voltage with Vmax = 1 V and Vmin = -1 V.	CO3	K3
h.	State two advantages of a single-phase bridge converter over a single-phase mid-point converter.	CO4	K1
i.	Define the concept of input power factor in controlled rectifiers.	CO3	K2
j.	What are the primary considerations when selecting components for power electronic circuits?	CO1	K3

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions

		Marks	CO#	Blooms Level
2. a.	Explain the operation of a single-phase AC voltage controller connected to an R load, including control strategies and waveforms.	5	CO1	K3
b.	Calculate the maximum values of average and RMS thyristor currents for a single-phase voltage controller supplying power to a resistive load from a 230V, 50 Hz source, given a firing angle.	5	CO4	K3
3.a.	Describe the functioning and control of step-down and step-up choppers, considering different duty cycle scenarios.	5	CO2	K3
b.	Evaluate the effectiveness of Sinusoidal Pulse Width Modulation (SPWM) techniques used in inverters, outlining their advantages and disadvantages across various applications.	5	CO3	K3
4. a.	Analyze the operation of a boost converter and provide relevant waveforms.	5	CO1	K3
b.	Provide a detailed circuit diagram illustrating the operation of a three-phase fully controlled converter with an R load and calculate the average output voltage.	5	CO2	K4
5.a.	Calculate the chopping frequency of a step-up chopper with an input voltage of 150V and an output voltage of 450V, given a thyristor conducting time of 150μseconds.	5	CO3	K4
b.	Choose suitable voltage control and harmonic reduction techniques for a specific power electronics application and justify your selection.	5	CO1	K4

6. a.	Discuss the functionality of a three-phase voltage source inverter in the 120-degree operating mode, outlining its benefits and limitations.	5	CO4	K4
b.	Assess the impact of various PWM techniques on inverter performance and output quality.	5	CO3	K3
7.a.	Analyze the working principle of a cuk-converter, examining its circuitry and waveforms.	5	CO3	K4
b.	Elaborate on the operation of a single-phase AC voltage controller with an RL load, considering the impact of the inductive element on control and performance.	5	CO2	K3
8. a.	Describe the operation of a three-phase half-controlled converter with an R load and derive the expression for the average output voltage.	5	CO4	K4
b.	Investigate the practical applications where AC voltage controllers are commonly utilized, emphasizing their significance in modern power systems.	5	CO2	K2

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