QP Code: RM23MTECH113 | Reg. No | | | | | | | | | | | AY 23

# GIET UNIVERSITY, GUNUPUR – 765022

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

## MPCPE2020 – Digital Control of Power Electronic and Drive Systems

(Power Electronics)

Time: 3 hrs | Maximum: 70 Marks

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

**PART – A** **(2 x 10 = 20 Marks)**

Answer ***ALL*** questions

| | | CO# | Blooms Level |
|---|---|---|---|
| a. | How are power transistors utilized in circuit simulation? | CO1 | K3 |
| b. | What are the applications of circuit simulation? | CO3 | K3 |
| c. | Explain the necessity of a snubber circuit in electronic circuits. | CO1 | K1 |
| d. | What is the importance of a snubber circuit? | CO2 | K1 |
| e. | Describe how numerical methods are applied to solve DC transient analysis problems. | CO3 | K2 |
| f. | Why is modeling necessary for specific circuits? | CO2 | K2 |
| g. | Can you name two applications of numerical methods in engineering? | CO1 | K2 |
| h. | What is the relation between α and β? | CO2 | K4 |
| i. | What makes IGBT popular today? | CO1 | K4 |
| j. | What are the different components involved in simulating a bridge rectifier circuit with an R-load? | CO2 | K3 |

**PART – B** **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions

| | | Marks | CO# | Blooms Level |
|---|---|---|---|---|
| 2. a. | Can you explain the principles behind pulse-width modulation methods for voltage control, including their types and advantages in various applications? | 5 | CO2 | K3 |
| b. | How do you model the dynamic behavior of R-C and R-L-C circuits accurately, considering factors such as transient response and frequency-dependent effects? | 5 | CO1 | K2 |
| 3.a. | What are the key aspects involved in simulating basic electric drives, including the incorporation of complex factors like motor characteristics and load dynamics? | 5 | CO2 | K2 |
| b. | How are pulse-width modulation methods typically implemented for voltage control in thyristor choppers, and what are the steps involved in simulating this process? | | CO3 | K3 |
| 4. a. | Could you elucidate the process of simulating a 3-phase IGBT circuit with an R-load, including the modeling of IGBTs and power transistors? | 5 | CO1 | K3 |
| b. | In the context of synchronous machines, delve into the details of state space analysis and its applications. | 5 | CO3 | K4 |
| 5.a. | How is the modeling of SCR and TRIAC typically incorporated into circuit simulations, and what considerations are important in this process? | 5 | CO1 | K2 |
| b. | Can you provide a comprehensive overview of space vector representation in a 6-pulse converter operating in inverter mode with a resistive load, detailing its principles and intricacies? | 5 | CO3 | K2 |
| 6. a. | When it comes to simulating space vector representation in various modes of operation for multi-pulse converters, what are the challenges and solutions associated with this process? | 5 | CO2 | K4 |

| | | | | |
|---|---|---|---|---|
| b. | How does state space analysis apply to linear systems, and what are its fundamental principles? | 5 | CO1 | K4 |
| 7.a. | Can you elaborate on the challenges and solutions associated with simulating space vector representation in various modes of operation for multi-pulse converters? | 5 | CO2 | K4 |
| b. | What are the intricacies of modeling electric drives, particularly in incorporating factors like motor characteristics and load dynamics into the simulation process? | 5 | CO3 | K4 |
| 8. a. | How is the modeling of SCR and TRIAC typically incorporated into circuit simulations, and what considerations are important in this process? | 5 | CO2 | K4 |
| b. | Describe the principles and advantages of using state-space analysis in the control of power electronic converters, with a focus on its application in improving system performance and stability. | 5 | CO2 | K4 |

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