**20EE504**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **January, 2024** | **Electrical and Electronics Engineering** | | |
| **Fifth Semester** | **Power Electronics** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | Define holding current of an SCR. | CO1 | L1 | 1M |
|  | b) | What are the various methods for protection of thyristors? | CO1 | L1 | 1M |
|  | c) | Why a thyristor cannot be turned off without forced commutation? | CO1 | L2 | 1M |
|  | d) | Which triggering method of SCR is the universal method? Why? | CO1 | L2 | 1M |
|  | e) | What is distortion factor? | CO2 | L1 | 1M |
|  | f) | How is power factor of semiconverter better than that of full converter? | CO2 | L2 | 1M |
|  | g) | What is the average output voltage for the triggering angle α=90º in a single phase 230V half controlled converter? | CO2 | L2 | 1M |
|  | h) | List few industrial applications of inverters. | CO3 | L1 | 1M |
|  | i) | Why voltage control is required in an inverter? | CO3 | L2 | 1M |
|  | j) | What is pulse-width modulation? | CO3 | L1 | 1M |
|  | k) | List the advantages and disadvantages of the dc-dc boost converter. | CO4 | L1 | 1M |
|  | l) | Define duty cycle of a chopper. | CO4 | L1 | 1M |
|  | m) | What is a step down chopper? | CO4 | L1 | 1M |
|  | n) | What are the advantages of cycloconverter? | CO4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Describe the different modes of operation of a thyristor with the help of its static V-I characteristic. | CO1 | L1 | 7M |
|  | b) | Explain the design of snubber circuits for thyristor protection. | CO1 | L2 | 7M |
| **(OR)** | | | | | |
| 3 | a) | With the help of neat structural diagram and suitable waveforms, explain the operation of IGBT. | CO1 | L1 | 8M |
|  | b) | Compare the performance of MOSFET and IGBT. | CO1 | L2 | 6M |
| **Unit-II** | | | | | |
| 4 | a) | Explain the operation of a single-phase semi- controlled converter with resistive load using relevant waveforms. | CO2 | L1 | 7M |
|  | b) | A single phase fully rectifier is used to supply power to load having impedance 200 Ω and 150 mH, from 230V, 50Hz, ac supply at a firing angle of 90º. Calculate i) Average values of output voltage and current and ii) RMS values of output voltage and current. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Describe the working of three-phase fully controlled bridge rectifier with resistive load in the continuous conduction mode using relevant waveforms. | CO2 | L1 | 7M |
|  | b) | Derive the expression for average output voltage, average load current and RMS output voltage for single-phase fully controlled converter with resistive load. | CO2 | L2 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Explain the operation of single pulse modulation of inverter with neat diagram. | CO3 | L1 | 6M |
|  | b) | A single-phase full-bridge inverter is operated from a 48V battery and is supplying power to a pure resistive load of 10Ω. Determine the output voltage and output power. | CO3 | L3 | 8M |
| **(OR)** | | | | | |
| 7 | a) | Describe the principle of operation of three phase inverter operating in 180º conduction mode with necessary diagrams. | CO3 | L2 | 14M |
| **Unit-IV** | | | | | |
| 8 | a) | Explain the operation of buck-boost converter in the CCM mode and obtain the expression for amplitude of ripple current. | CO4 | L2 | 7M |
|  | b) | Describe the basic principle of operation of three-phase to single-phase cycloconverter. | CO4 | L1 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Explain the operating principle of dc chopper with a suitable diagram. Derive expressions for average output voltage and rms output voltage. | CO4 | L2 | 7M |
|  | b) | Explain the operation of a single phase AC voltage controller with a neat circuit diagram and output wave forms with respect to source voltage waveforms at α = 60º for R-load. | CO4 | L1 | 7M |

