Code No: R1931022 **R19** **SET - 1**

III B. Tech I Semester Regular Examinations, February-2022

POWER ELECTRONICS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Describe the different modes of operation of a thyristor with the help of its static V-I characteristics. [8M]
   b) Explain the different turn-on methods of SCR. [7M]

(OR)

2. a) A thyristor is made up of a number of SCRs connected in series and parallel. The string has voltage and current ratings of 12 kV and 5 kA respectively. The voltage and current ratings of available SCRs are 1900 V and 1200 A respectively. For a string efficiency of 95%, calculate the number of series and parallel connected SCRs. [8M]
   b) Demonstrate the characteristics of power IGBT. [7M]

UNIT-II

3. a) Explain the operation of single phase fully controlled bridge type rectifier with R-load and derive the expression for average output voltage. [10M]
   b) What is the significance of freewheeling diode? Explain. [5M]

(OR)

4. a) Explain with neat sketches the operation of single phase half controlled rectifier with RLE-load. [8M]
   b) Explain the circulating current mode of operation of single phase dual converter with associated circuits. [7M]

UNIT-III

5. a) Explain, with neat sketches, the operation of three phase halfwave converter with R-load. [8M]
   b) Explain the working of a single phase cyclo-converter for R-load of frequency $f_0 = \frac{1}{4} f_s$. [7M]

(OR)

6. Explain about three phase AC voltage controller for R-load with necessary circuits and waveforms. [15M]

UNIT-IV

7. Explain the operation and derive necessary relations of Buck converter in continuous conduction mode. [15M]

(OR)

8. a) Explain the operation of basic Chopper circuit. [8M]

   b) A boost converter has input voltage of 5 V and it operates at 20 kHz. When the average output voltage V_o = 10 V, the average load current I_o = 0.8 A, L = 100 μH and C = 47 μH, determine [7M]
      i) Duty cycle
      ii) Ripple current of inductor ΔI
      iii) The maximum current flows through inductor I_{max}

UNIT-V

9. a) Compare 180^0 and 120^0 conduction mode of three-phase inverters. [9M]

   b) A single phase full bridge inverter is operated from a 48 V battery and is supplying power to a pure resistive load of 10 Ω. Determine: [6M]
      i) The fundamental output voltage and the first five harmonics.
      ii) RMS value by direct integration method and harmonic summation method.
      iii) Output rms power and output fundamental power.

(OR)

10. a) Explain the operation of single-phase half bridge inverter for RL-load with the aid of relevant waveforms. [8M]

    b) What is the difference between Unipolar and Bipolar Switching? Demonstrate with waveforms. [7M]

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