B.Tech. V Semster (Main/Back) Examination, Nov./Dec. - 2017
Electrical & Electronics Engineering
5EX1A Power Electronics
EX, EE

Time : 3 Hours

Maximum Marks : 80
Min. Passing Main : 26
Min. Passing Back : 24

Instructions to Candidates :

*Attempt any **five** questions, selecting **one** question from each **unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Explain and draw the switching characteristics of the power IGBT. (8)

   b) Describe the various commutation methods of thyristor. (8)

OR

1. a) Explain and draw the switching characteristics of the power GTO. (8)

   b) Explain the constructional details and working of power MOSFET. (8)

Unit - II

2. a) Explain and draw the switching characteristics of SCR. (8)

   b) Explain various turn ON methods of thyristor. (8)

OR

2. a) Explain the series and parallel operation of SCR. (8)

   b) A SCR with a rating of 1000V and 200A are available to be used in a string to handle 60 KV and 1 KA. Calculate the number of series and parallel unit required in case of derating factor is

   i) 0.1   ii) 0.2 (8)

Unit - III

3. a) Describe working of a 1 - ϕ full wave converter with RLE load through a waveform of a supply voltage, load voltage, load current and voltage across thyristor. Also derive the expressions for load voltage and output power. (8)

b) A 1 - φ half wave converter has resistive load 20 Ω input voltage 230 V, 50 Hz with α = 45° Determine the
  i) RMS value of output voltage
  ii) Power delivered to the load
  iii) Power factor (8)

OR

(8)

3. a) Explain the principle of 3-φ dual converter.
  b) A 1 - φ full wave converter has a RL load having L = 6.5 MH, R = 0.5 Ω and E = 10V. the input voltage is Vs = 120 V at (rms). 60 Hz. Determine -
  i) The load current I_{LO} at wt = α = 60°
  ii) The average thyristor current I_A
  iii) The RMS thyristor current I_R
  iv) The RMS output current I_{RMS}
  v) The average output current I_{dc}. (8)

Unit - IV

4. a) Explain pulse width modulation control technique of power factor improvement along with circuit diagram and waveform. (8)
  b) A 3 φ, M - 3 converter is operated from 230V, 50Hz supply with load resistance R = 10Ω. An average output voltage of 50% of the maximum possible output voltage is required. Determine.
  i) Firing Angle
  ii) Average and RMS value of load current.
  iii) Rectification efficiency. (8)

OR

4. a) Describe the working principle of a single phase full wave semi converter with RL Load through the waveforms of supply voltage, load voltage, load current and voltage across thyristor. And also derive expressions of its. (8)
  b) Explain in detail the extinction angle control scheme for power factor improvements. (8)

Unit - V

5. a) What is the principle of operation of a step up chopper. (8)
  b) Explain the load commutated chopper along with relevant circuit diagram and waveform. (8)

OR

5. a) Derive the expressions for steady state maximum and minimum current for type A chopper. (8)
  b) Explain multiphase chopper along with relevant circuit diagram and waveform. (8)