[4658] – 63

Seat No.	

T. E. (Electrical) (Semester – I) Examination, 2014
POWER ELECTRONICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*
2) Answer ***any three*** *questions from* ***each*** *Section.*
3) Black figures to the ***right*** *indicate* ***full*** *marks.*
4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data ***if*** *necessary.*

SECTION – I

1. a) Draw gate drive circuit for GTO. Discuss switching characteristics and give comparison between SCR and GTO. **8**
   b) Explain and compare R and RC firing circuit for SCR. **8**

OR

2. a) Draw gate characteristics of SCR. Explain how value of gate voltage and gate current can be selected. **8**
   b) Why SCR is called as current controlled device ? Define Latching current and Holding current. **8**

3. a) What are converters ? Explain with circuit diagram and waveforms working of 3ϕ half controlled converter with highly inductive load. Deduce the equation for o/p voltage. Plot W/Fs at $\alpha = 60°$. **10**
   b) Explain single phase dual converter. Draw waveforms for output voltage at $\alpha = 60°$ and $\alpha = 150°$. Comment on mode of operation of 1ϕ dual converter at 60° and 150°. **8**

OR

4. a) With neat circuit diagram and all necessary waveforms explain the working of three phase fully controlled bridge converter feeding RLE load. Explain modes of operation. **10**
   b) Write a note on selection of transformers and semiconductor devices for converters. **8**

5. a) Describe the working of a two stage sequence control of voltage controllers for R load. What is the advantage of this controller over 1ϕ full wave voltage controller ? **8**
   b) Discuss various technique adopted for protection of TRIAC and DIAC. **8**

OR

6. a) Explain static on load tap changing of transformer using a. c. regulators. Draw output voltage waveform using two stages. **8**

   b) Explain four mode operation of TRIAC. **8**

SECTION – II

7. A) Describe the switching characteristic of Power MOSFET and give applications with control requirements. **8**

   B) Give a comparison between MOSFET and IGBT. **8**

OR

8. A) Describe the basic structure of MCT. Give its equivalent circuit and explain the turn on and turn off process. **8**

   B) Explain output and transfer characteristics of IGBT. **8**

9. A) Explain four quadrant chopper feeding RLE load in detail. **8**

   B) What is time ratio control in dc choppers ? Explain the use of TRC for controlling the output voltage in choppers. **8**

OR

10. A) Explain the principle of operation of step up chopper. Derive expression for output voltage. **8**

    B) Draw a power circuit diagram for a type-A chopper. Show load voltage waveforms for $\alpha = 0.3$ and $\alpha = 0.8$. For both these duty cycles, calculate : the average and rms values of output voltage in terms of source voltage. **8**

11. A) What is a need for controlling the voltage at the output terminals of an inverter ? Describe and compare various methods employed for the control of output voltage of inverter. **9**

    B) What is pulse width modulation ? Explain any one PWM technique in detail. **9**

OR

12. A) Explain with circuit diagram and waveforms operation of single phase current source inverter. **8**

    B) Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **10**

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