

Printed Pages : 3



EEE-602

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 121603**

Roll No.

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### **B. Tech.**

(SEM. VI) THEORY EXAMINATION, 2014-15

### **POWER ELECTRONICS**

Time : 3 Hours]

[Total Marks : 100

- Note: (1) Attempt all questions.  
(2) All questions carry equal marks.

- 1 Attempt any four parts: 5×4=20
- (a) What are the characteristics of an ideal power switching device?
  - (b) Explain the switching characteristics of a BJT.
  - (c) Find the number of thyristors each with a rating of 500V and 75A required for each branch of a series parallel combination for a circuit for a total voltage and current rating of 7.5KV and 1 KA. Assume derating factor of 14%.
  - (d) Explain the significance of latching and holding currents.
  - (e) Explain the steady state and switching characteristics of MOSFET.
  - (f) Explain working of Triac.

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2. Attempt any two parts : 10×2=20
- (a) What is a DC chopper? Describe the various types of chopper configuration with neat and appropriate diagrams.
  - (b) Discuss the two transistor model of a thyristor. Using this model, describe the various mechanisms of turning on a thyristor.
  - (c) Explain the resonant pulse commutation with the help of circuit diagram and waveforms. Explain the effect of accelerating diode.
3. Attempt any two parts:- 10×2=20
- (a) A single phase half controlled bridge operated from the 230 V, 50 HZ mains feeds a resistive load of  $100\ \Omega$ . If the firing angle is  $60^\circ$ , Calculate,
    - (i) Average output voltage
    - (ii) rms output voltage
    - (iii) total output power
    - (iv) DC output power
    - (v) load current at instant of turn on
  - (b) What do you understand by dual converters? Explain the operation of a  $3\ \phi$  dual converter using circulating current mode of operation. How are firing angles of two converters controlled?
  - (c) Discuss the working of  $1\ \phi$  full wave ac-dc converter taking into account the effect of source inductance. Draw the output voltage waveform for firing angle of  $30^\circ$ .

4. Attempt ant two parts:- 10×2=20
- (a) Describe the basic principle of working of  $1\phi$  to  $1\phi$  step down cycloconverter for both continuous and discontinuous conductions. Make the conduction of various thyristor also.
  - (b) Describe  $1\phi$  ac voltage controller with inductive and resistive loads. Describe an expression for output voltage.
  - (c) Show that the fundamental rms value of per phase output voltage of low frequency for an m pulse cycloconverter is given by:  

$$V_{ov} = V_{phm} \pi \sin \pi m.$$
5. Attempt ant two parts:- 10×2=20
- (a) Discuss the working principle of a  $1\phi$  series inverter. What are the advantages and disadvantages of series inverter.
  - (b) Explain operation of a  $3\phi$  bridge inverter employing 1200 mode of operation. Draw waveforms of phase voltages and any one line voltage assuming star connected resistance load.
  - (c) The single phase quasi-square wave bridge inverter operators from a DC supply of 200v at a frequency of 100 Hz and feeds a resistive load of  $10\Omega$  calculate:
    - (i) Duration of the ON period if the rms value of the load voltage is 100v.
    - (ii) Peak supply current
    - (iii) Average DC supply current.