Code: R7310204

B.Tech III Year I Semester (R07) Supplementary Examinations December 2015

POWER ELECTRONICS

(Common to EEE and E.Con.E)
(For 2008 regular admitted batch only)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Distinguish between power BJT and Power MOSFET.
   (b) With the help of neat structural diagram and suitable waveforms, explain the operation of IGBT.

2 (a) What is the necessity of connecting SCRs in series?
   (b) What are the problems associated with series connection of SCRs? How are they eliminated?

3 (a) Explain the operation of 1-phase half controlled bridge converter with R-load and associated waveforms.
   (b) Derive the expression for average load voltage for α = 30deg.

4   A single phase full-wave mid-point converter with freewheeling diode is supplied from a 120 V, 50 Hz supply with a source inductance of 0.33mH. Assuming the load-current is continuous at 4 A.
        Find the overlap angles for:
   (a) Transfer of current from a conducting thyristor to the commutating diode.
   (b) From the commutating diode to a thyristor when the firing angle is 45deg.

5 (a) Describe the operation of three pulse converter with R-load and draw associate waveforms.
   (b) Derive the voltage and RMS current relationships for three pulse converter with R-load.

6   Describe the operation of single phase half-wave ac voltage regulator with the help of voltage and current waveforms. Also, derive the expression for average value of output voltage.
        A single-phase half-wave a.c voltage controller feeds power to resistive load of 6 Ω from 230 V, 50 Hz source. The firing angle of SCR is π/2. Calculate:
        (i) The RMS value of output voltage.
        (ii) The input power factor.
        (iii)The average input current.

7 (a) Derive an expression for output power for type D chopper.
   (b) Explain in detail the principle operation of the four quadrant chopper.

8 (a) Write the comparison between voltage sourced inverter and current sourced inverter.
   (b) A capacitor commutated 1-phase bridge inverter is operated at 50 Hz with load resistance of 5Ω. Thyristor turn off time is 62 μs. Determine: (i) Commutating capacitor C for successful commutation of SCR. (ii) Load current I_L.

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