Code: R7310204

R7

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013
POWER ELECTRONICS
(Common to EEE and E.Con.E)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a)   Explain the various firing methods with the help of neat circuit diagram for SCR when used in both AC and DC circuits.

(b)   Draw and discuss the V-I characteristics of BJT.

2 (a)   Describe the series and parallel operations of SCRs.

(b)   A 100 A SCR is to be used in parallel with a 150 A SCR. The on-state voltage drops of the SCRs are 2.1 and 1.75 V, respectively. Calculate the series resistance that should be connected with each SCR if the two SCRs have to share the total current 250 A in proportion to their ratings.

3   A single phase one-pulse converter with RLE load has the following data:
Supply voltage = 230 V at 50 Hz, R = 2 ohms, L = 1 mH and E = 120 V, extinction angle (β) = 220 deg, firing angle (α) = 25 deg.

(a)   Calculate the voltage across thyristor at the instant SCR is triggered.

(b)   Find the voltage that appears across SCR when current decays to zero.

(c)   Find the peak inverse voltage for the SCR.

4 (a)   Explain the operation of 1-phase fully controlled bridge converter with the help of neat diagram.

(b)   A single phase fully-controlled bridge circuit is used for obtaining a regulated dc output voltage. The RMS value of the ac input voltage is 230 V, and the firing angle is maintained at $\pi/3$, so that the load current is 4 A. Calculate: (i) The dc output voltage. (ii) Active and reactive power input.

5 (a)   Distinguish between three pulses and six pulses converters.

(b)   Explain the operation of three phase mid-point converter with associate waveforms.

6 (a)   List the advantages and disadvantages of single phase half-wave (unidirectional) ac voltage regulator.

(b)   A single-phase a.c. voltage regulator with R-L load has the following details: Supply voltage: 230 V at 50 Hz, R = 4 Ω and ωL= 3Ω. Calculate: (i) The control range of firing angle. (ii) The maximum value of r.m.s load current. (iii) The maximum power and power factor.

7 (a)   Draw the schematics of step-down and step-up choppers? Explain in detail.

(b)   A step up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of thyristor-chopper is 100 µs, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage.

8   The full bridge inverter has a source voltage E_{dc} = 220 V. The inverter supplies an RLC load with R = 10 Ω, L = 10 mH and C = 52 µF. The inverter frequency is 400 Hz. Determine:
(i) The RMS load current at fundamental frequency.   (ii) The RMS value of load current.
(iii) The power O/p. (iv) The average supply current.
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