Code: 9A02504

R09

III B. Tech I Semester (R09) Supplementary Examinations, May 2012

POWER ELECTRONICS

(Common to Electrical & Electronics Engineering & Electronics & Control Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Explain the operation of SCR using schematic diagram and explain the importance of junctions.
(b) Discuss the conditions which must be satisfied for turning on an SCR with a gate signal.

2 Explain the R-C triggering circuit with suitable waveforms.

3 (a) Explain, the half-waving effect in a single-phase symmetrical half controlled converters.
(b) A voltage source e=100 sin 377 t supplies a resistive load of 100 ohm through a thyristor, which performs half-wave controlled rectification. Calculate the average power in the load, if the firing angle is fired at 45 deg. With respect to the supply voltage waveform.

4 (a) Explain the effect of freewheeling diode in detail. Also justify the statement “Freewheeling diode improves the power factor of the system”.
(b) A single phase fully controlled bridge is connected to an a.c supply of 230 V and 50 Hz is used for the speed control of dc motor with separate field excitation. The full load average armature current is 10 A and the converter operates at a firing angle $\alpha=\pi/4$. Neglecting the inductance and resistance of both armature and source, calculate the minimum value of series inductance, Ld required in the armature circuit to provide for continuous current conduction.

5 (a) Describe the working principle of continuous mode of three phase 3-pulse converters with associate waveforms at firing angle 60^{o}.
(b) What are the advantages of freewheeling diode?

6 (a) List the advantages and disadvantages of Triac over SCR.
(b) List the main features of Triac.

7 (a) Describe the Morgan chopper with associated voltage and current waveforms.
(b) Enumerate the merits of Morgan chopper compared to Jones chopper.

8 (a) Explain the operation of 1-phase modified Mc Murray half bridge inverter with neat diagram.
(b) The 1-phase modified Mc Murray half bridge inverter is fed by a dc source of 230 V. The dc source voltage may fluctuate by $\pm$10%. The current during commutation may vary from 30 to 120 A. Determine the values of the commutating components if the thyristor turn off time is 10 μs. Also compute the values of R.

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