

Code: R7310204

R07

III B. Tech I Semester (R07) Supplementary Examinations, May 2012 **POWER ELECTRONICS** (Common to EEE, E.Con.E)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions All questions carry equal marks

- 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 (a) Explain the two transistor analogy of an SCR with the help of a neat diagram.
 - (b) Discuss the triggering conditions of an SCR.
- 3 (a) Distinguish between a half controlled and fully controlled rectifiers with regard to input and output performance.
 - (b) Calculate the average current through a load resistance of 100 ohm when it is connected in series with a large inductance across the terminals of a half controlled single phase bridge circuit.
- 4 (a) Derive the expression for the input power factor of 1-phase fully controlled bridge rectifier.
 - (b) A single phase fully controlled bridge converter is supplied at 230 V, 50 Hz with source inductance of 3mH. Neglect resistance voltage drop, when the converter is operating at firing angle of 45^o and the load current is constant at 15 A. Determine the load voltage.
- 5 (a) Explain the operation of three phases fully controlled bridge converter with R load with associate waveforms.
 - (b) Why the circulating current mode preferred over non circulating current mode in dual converter?
- 6 (a) Describe three-phase to three-phase cycloconverter with relevant circuit arrangements using 18 thyristors and 36 thyristors. What are the advantages of three-phase bridge over three-phase to three-phase cycloconverter circuit consisting of 18 thyristors?
 - (b) A single-phase to single-phase mid-point cycloconverter is delivering power to a resistive load. The supply transformer has a turn's ratio of 1:1:1. The frequency ratio is $f_o/f_s=1/5$. The firing delay angle α for all four SCRs are the same. Sketch the time variations of the following waveforms for $\alpha=0^0$ and 30^0 .
 - (a) Supply voltage. (b) Output current. (c) Supply current.
- 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 nonconducting time of thyristor-chopper is 100 μ s, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage.
- 8 (a) Explain the operation of 1-phase half bridge inverter with neat diagram.
 - (b) Derive the expressions for steady state analysis of 1-phase inverter.
