

R09**Code: 9A02504**

B.Tech III Year I Semester (R09) Supplementary Examinations December 2015

POWER ELECTRONICS

(Common to EEE and E.Con.E)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Draw and discuss V-I characteristics of Light activated SCS.
(b) Draw and discuss V-I characteristics of TRIAC.
- 2 Explain the R-C triggering circuit with suitable waveforms.
- 3 (a) Explain the operation of 1-phase half controlled bridge converter with RL-load with and without freewheeling diode. Also sketch circuit and waveforms for $\alpha = 60^\circ$.
(b) A single phase half-wave rectifier is used to supply power to load of impedance 10 ohm from 230 V, 50 Hz a.c supply at the firing angle of 30 deg. Calculate: (i) Average load voltage. (ii) Effective value. (iii) Load current.
- 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 45deg and the load current is constant at 15 A. Determine the load voltage.
- 5 (a) Explain the line commutated inverter operation of a 3-phase full converter.
(b) A naturally commutated 3-phase bridge inverter is used for power transfer from a 300 V to a 3-phase 230 V, 50 Hz ac supply. A large filter inductor having 10 Ω resistances is included in dc side. Calculate the power transferred and power factor if: (i) $\alpha = 90^\circ$ and (ii) $\alpha = 120^\circ$.
- 6 (a) Distinguish between two-stage and multistage sequence control of voltage controllers. What are the advantages of multistage over two-stage sequence control?
(b) A three-phase, three-wire bidirectional controller supplies a star connected resistive load of $R = 5 \Omega$ and line-to-line input voltage is 210 V(RMS) 50 Hz. The firing angle $\alpha = 60^\circ$. Calculate: (i) The RMS output phase voltage E_o . (ii) The input power factor Pf.
- 7 (a) What is a DC chopper? Describe the various types of chopper configurations with necessary sketches.
(b) A DC chopper circuit connected to a 100 V d.c source supplies an inductive load having 40mH in series with a resistance of 5 Ω . A freewheeling diode is placed across the load. The load current varies between the limits of 10 A and 12 A. Determine the time ratio of the chopper.
- 8 The full bridge inverter has a source voltage $E_{dc} = 220$ V. The inverter supplies an RLC load with $R = 10 \Omega$, $L = 10$ mH and $C = 52 \mu$ F. 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