

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from remaining.
 (3) Assume **suitable** data if **necessary**.
 (4) **Figures** to the **right** indicate **full marks**.

1. Explain in brief the following :— 20
- What are different performance parameters for controlled rectifiers ? Explain their significance.
 - State the conditions for getting inversion mode of operation in case of line commutated convertors.
 - Compare BJT, SCR and JGBT.
 - Explain the basic requirements for the successful triggering of thyristors in detail.
2. (a) A single phase fully controlled bridge convertors supplies an inductive load. Assuming that the output current is virtually constant and is end to I_d . Determine the following performance measures. If the supply voltage is 230 V and if the firing angle is maintained at 60° :— 10
- Average output voltage
 - Supply RMS current
 - Fundamental power factor
 - Supply power factor
 - Voltage ripple factor.
- (b) (i) Explain Latch up in JGBT. 5
 (ii) Explain need of Isolation in power electronics. 5
3. (a) Explain the operation of A.C. phase control circuit using Triac-Diac for lamp dimmer application. 10
 Draw the wave form across load.
- (b) A 3ϕ full wave converter bridge is connected to supply of 230 volt per phase and frequency of 50 Hz. The source inductance per phase i.e. L_s is 4 mH. The load current is 20 Amp. If the load consists of D.C. source of 400 volt with internal resistance of 1Ω . Calculate — 10
- Firing angle delay
 - Overlap angle.
4. (a) Why commutation failure may occur in case of Jones choppers ? How it can be avoided ? 10
- (b) In a basic step down D.C. chopper circuit Input voltage is 200 V. $R = 5 \Omega$ drop across chopper is 2 Volt. Duty cycle is 0.4. Determine — 10
- Average output voltage
 - RMS o/p voltage
 - Chopper efficiency.
5. (a) Draw and explain the simple SCR series Invertor circuit employing class A type commutation. Draw and discuss the important waveform, state the limitation of this series invertor. 10
- (b) Obtain an expression for circuit turn-off time Jones chopper $C = 40 \mu\text{f}$, $L_1 = 100 \mu\text{H}$, $L_2 = 30 \mu\text{H}$, $V_s = 100$ volt. Find out the highest turn-off time for main SCR T_1 and maximum load current that can be safety commutated. 10

6. (a) Explain the method of speed control of 3-phase slip ring induction motor using slip power bearing scheme. 10
- (b) Explain with block schematic the working of microcontroller based circuit of D.C. motor. 10
7. Write short notes on any **four** of the following :— 20
- (a) Ramp and Pedestal scheme for triggering SCR circuit
 - (b) Commutation circuits of SCR
 - (c) Cooling methods of power semiconductor devices
 - (d) V/F control for induction motor
 - (e) Modified Series Invertor
 - (f) Parallel Invertor.