

Cbn. 5155-09.

(REVISED COURSE)

SP-6845

[Total Marks : 100]

(3 Hours)

Power Electronics

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

1. (a) What are the various triggering methods of SCR ? Explain one in detail. 20
 (b) Explain how dv/dt and di/dt protection circuits are useful for SCR.
 (c) Define latching current, holding current, forward break over voltage, reverse break over voltage and write value of general rating of SCR.
 (d) Explain the operation of basic series Inverter with relevant waveforms and state its limitations.
2. (a) Explain Latch up in IGBT. How does the latchup take place and how to avoid latch up ? 10
 (b) Compare (i) SCR and IGBT (ii) SCR and TRIAC (iii) SCR and GTO. 10
3. (a) Explain need of isolation in Power Electronics ? Draw the various circuits available for isolation. 10
 (b) The half wave converter is feeding resistive load and firing angle is $\alpha = \pi/2$. Find (i) Rectification efficiency (ii) Form factor (iii) Ripple factor (iv) TUF and (v) PIV of thyristor. 10
4. (a) Explain the operation of Jones chopper along with waveform across load and capacitor voltage. Obtain an expression for circuit turn off. 10
 (b) Jones chopper $C = 40\mu\text{f}$, $L_1 = 100\mu\text{H}$ (series with capacitor), $L_2 = 30\mu\text{H}$, $V_s = 110\text{V}$. Find out the highest turn off time for main SCR T1 and maximum load current that can be safely commutated. 10
5. (a) Explain different forced commutation circuits. 10
 (b) The series inverter has $L_1 = L_2 = 50\mu\text{H}$, $C = 6\mu\text{f}$, $R = 2\Omega$. The d.c. input voltage is $V_s = 220\text{V}$ and the frequency of output voltage is $f = 7\text{KHz}$. The turn off time of thyristor is $t_q = 10\mu\text{sec}$. Determine :
 (i) Circuit turn off time t_{off}
 (ii) The maximum permissible frequency f_{max}
 (iii) The peak—peak capacitor voltage
 (iv) The peak load current I_p . 10
6. (a) Explain Variable voltage and variable frequency (V/F) method of speed control for 3-phase induction motor. 10
 (b) Explain Microcontroller based speed control of D.C. Motor. 10
7. Write short notes on :— 20
 (a) Cooling methods of power semiconductor devices
 (b) IR compensation
 (c) Modified series inverter
 (d) Parallel inverter.