B.E. (Electronics) (Sem VIII) (Rev) 22/5/07

Power Electronics.

1fh-19-5-Ex-Nk-07.2

Con. 2656-07. ND-8234

(REVISED COURSE)

Library.

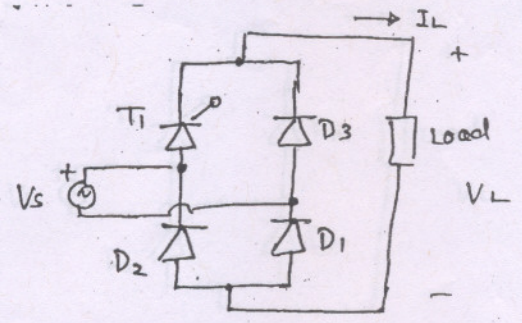
(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume suitble data if **required.**
(4) Illustrate answers with sketches whenever **required.**

1. Explain in brief (any **four**) :— **20**
   (a) Explain the importance of dv/dt and di/dt ratings of SCR.
   (b) Compare BJT, SCR and 1GBT.
   (c) What is an inverter ? List a few industrial applications of inverters.
   (d) What is the basic principle of dc chopper operation ? Derive an expression for its average dc output voltage.
   (e) Explain the need of commutation in thyristor circuits. What is voltage commutation and current commutation ?
   (f) What is Latching current, Holding cement, Forward break-over voltage, Reverse break-over voltage of a Thyristor

2. (a) Explain the full wave A.C. control using TRIAC and DIAC. Draw waveforms. **10**
   (b) Explain inverse cosine triggering circuit for SCR. How triggering angle α is changed ? **10**

3. (a) (i) A single phase controlled rectifier bridge consists of one SCR and three diodes as shown in the diagram. Sketch output voltage waveform for a firing angle $\alpha < 90°$ for SCR and obtain expression for average output voltage under the assumption of continuous current. **10**



   (ii) Draw waveforms of current through T_1, D_1, D_2 and D_3 and I_L if $V_S = V_m$ sinwt.
   (iii) If ac source voltage is 230 V; 50 Hz and firing angle 45° find average output current and power delivered to battery in case Load is of R = 5 Ω, L = 8 mH and E = 100 V.

   (b) Draw and design the UJT triggering circuit. The parameters of the UJT are : **10**
   $\eta = 0{\cdot}72$, $I_p = 0{\cdot}6$ mA, $V_p = 18$ V. $I_V = 2{\cdot}5$ mA, $V_V = 1{\cdot}0$ V, $R_{BB} = 5$ KΩ, Normal leakage current with emitter open = 4· mA. The firing frequency is 2 kHz. For C = 0·4 μF compute the values of resistors. It is required to change the firing frequency by varying charging resistor R, obtain maximum and minimum values of R and corresponding frequencies.

4. (a) Explain the operation of Jones Chopper along with the waveforms across load and capacitor voltage. Obtain an expression for circuit turn-off time available so as to select SCRs with proper turn-off time ratings. **10**
   (b) A voltage commutated chopper feeds power to a battery-power electric car. The battery voltage is 60 V, starting current is 60 A and thyristor turn-off time is 20 μsec. Calculate the values of the commutating capacitor C and L. Also find Peak current through main thyristor, auxilliary thyrister. **10**

5. (a) Draw the circuit diagram and explain working of basic simple single phase parallel inverter without feedback diodes. Draw waveforms for V_c, I_c, voltage and current of a thyristor and output voltage and current. **10**
   (b) Calculate the output frequency of a series inverter with L = 6 mH, C = 1·2 mF and R = 100 Ω. T_{off} = 0·2 ms. If the load resistance is varied from 40 Ω to 140 Ω find out the range of output frequency. **10**

6. (a) Explain four quadrant operation of a dc drive. How this operation will be achieved ? What types of controlled rectifiers will be needed ? Suggest the control strategy for the same. **10**

(b) Explain slip-power recovery scheme in a.c. drives. **10**

7. Write short notes on any **four** :— **20**

(a) V/F control for Induction motor

(b) Ramp and Pedestal scheme for triggering SCR

(c) Ratings of SCR

(d) Effect of source inductance on output voltage of full controlled rectifier

(e) Class B commutation of SACR

(f) Turn On & Off time of SCR.
