B.E Sem-VIII | Rev | E+TX. Power Electronics. 15/5/09 11 am to 2 pm

P4–Exam.–09–222

Con. 2677–09. **(REVISED COURSE)** **VR–4155**

(Library).

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining.
(3) Assume **suitable** data if **necessary.**

1. Explain in brief (any **four**) :– **20**

   (a) Explain two transistor Analogy of SCR and obtain an expression for Anode Current.

   (b) A thyristor is triggered by a pulse train of 5 KHz. Duty Ratio of pulse train is 0·5. If allowable average gate power is 100 watts. Calculate the true maximum allowable gate drive power.

   (c) Compare IGBT and SCR

   (d) Is it possible to obtain inversion mode operation, in case of semiconverter feeding highly inductive load. Justify your answer.

   (e) Explain Importance of $\frac{dv}{dt}$ and $\frac{di}{dt}$ ratings along with proper protection circuit for SCR.

2. (a) In case of fully Controlled Bridge Rectifier (single phase) assuming continuous and ripple free output current, feeding an active load. Draw the following waveforms at $\alpha = 30°$. **10**

   (i) V_{out} ie. Output Voltage
   (ii) V_{SCR} ie. Voltage a/c any SCR
   (iii) I_{out} ie. Output Current
   (iv) I_s ie Input Supply Current.

   (b) UJT synchronized circuit is used to trigger SCRs in full wave controlled (midpoint) rectifier. Input voltage is 230 V, 50 Hz, output d.c. voltage variation is required from 100 to 150 V. Find the range of firing angle and its corresponding value of R required in triggering circuit. **10**
   UJT Data : $\eta = 0{\cdot}63$, $V_{BB} = 18$ volt, $C = 0{\cdot}1$ μf.

3. (a) A 3 phase full wave converter bridge is connected to supply voltage of 230 V 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. voltage source of 400 V with Internal resistance of 1 Ω. Calculate (i) firing angle delay (ii) overlap angle. **10**

   (b) Explain the operation of A.C. phase control circuit using Triac Diac for lamp Dimmer application. Draw the waveform across load. **10**

[TURN OVER

4. (a) In a basic step down d.c. chopper circuit, Input voltage is 230 V, R = 10Ω, drop across chopper switch is 2 Volt and duty cycle is 0·4. Determine – 10

(i) Average output voltage
(ii) rms output voltage
(iii) Chopper efficiency.

(b) Draw the diagram of Jones Chopper. Explain from the diagram, how commutation voltage is developed across capacitor if – 10

(i) SCR1 is triggered first and if
(ii) SCR2 ie. Auxiliary SCR is triggered first.

5. (a) Draw the diagram of basic Series Inverter. Explain its operation with output waveform. Obtain an expression for turn off time available in terms of w_0 and w_r. 10

(b) Explain the operation of complementry commutation circuit. Draw the waveform across any one SCR and capacitor. 10

6. (a) Speed of D.C. Motor is controlled by Armature voltage control using fully controlled bridge converter at $\alpha = 60°$. Motor specifications are $R_a = 0{\cdot}25\ \Omega$, $R_f = 150\ \Omega$, $I_a = 20$ Amp continuous and ripple free, Input is 230 V, 50 Hz. Now to operate the Motor in Inversion mode, the polarity of back emf is reversed by reversing the Polarity of field current, determine – 10

(i) delay angle to maintain armature current constant
(ii) Power fed back to supply.

(b) Explain the speed control method of Slip Ring Induction Motor using Slip Power Recovery Scheme. 10

7. Write short notes on (any **three**) :– 20

(a) Microcontroller based speed control of D. C. Motor
(b) Triggering circuit using IC TCA 785
(c) Performance Parameters of Uncontrolled Rectifier
(d) Types of chopper as per Quadrant of operation.