AU – 2670

Fifth Semester B. E. (Electronics Engg.) (CGS) Examination

POWER ELECTRONICS

Paper – 5 XN 02/5 XT 02

(USC – 10669)

P. Pages : 4

Time : Three Hours] [Max. Marks : 80

Note : (1) Due credit will be given to neatness and adequate dimensions.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answer necessary with the help of neat sketches.
(4) Use pen of Blue/Black ink/refill only for writing the answer book.

SECTION A

1. (a) Draw and explain the dynamic characteristics of a thyristor during its turn off process. 7

   (b) Explain the working of GTO using construction, characteristics and also explain the term 'back porch current.' 7

OR

2. (a) Define the following terms :

   (i) Latching current.

   (ii) Rate of Rise of Voltage.

   (iii) I^2T Rating.

   (iv) Reverse Recovery Time. 8

   (b) Draw and explain the phase control circuit using DIAC and TRIAC. 6

3. (a) Why SCRs are connected in series? What are the problems when SCRs are connected in series ? How to overcome these problems ? 5

(b) In a string of 12 thyristors connected in series are subjected to dc voltage of 15 KV. The recovery charge difference and the maximum leakage current of thyristors are 150 μc and 10 mA respectively. Each thyristor has static equalization resistance of 56 kΩ and dynamic equalization capacitance of 0.5 μF. Determine :—

(i) The maximum steady state voltage sharing.

(ii) Steady state derating factor.

(iii) The maximum transient voltage sharing.

(iv) The transient voltage derating factor. 8

OR

4. (a) What is Radio frequency Interference ? How to overcome it ? 5

(b) What are the different methods of triggering series connected SCRs ? Draw the circuits. 4

(c) Define the following terms :

(i) String efficiency for parallel connected SCRs.

(ii) String efficiency for series connected SCRs.

(iii) % parallel Derating.

(iv) % series Derating. 4

5. (a) Derive the expression for average output voltage and current of a 1Ø half controlled Asymmetrical bridge rectifier for a heavily inductive load. Why is it called as Asymmetrical ? 7

(b) What is Dual converter ? Draw and explain 1Ø non-circulating current type dual converter. 6

OR

6. (a) What is phase control ? Derive the expression for average output voltage and current of a 1ϕ fully controlled bridge rectifier for purely resistive load. 7

(b) A 1ϕ half controlled bridge converter is supplied at 120 V ac supply. Determine the DC load voltage at firing delay angle of 90^0. Assuming thyristor and diode volt drops of 1.5 V and 0.7 V respectively. 6

SECTION B

7. (a) Find the values of L and C for class 'B' commutation having load current of 20 A. Turn off time required is 80 μsec, and the supply voltage is 200 V. Draw the circuit diagram. 7

(b) Explain the principle of operation of 3ϕ bridge inverter (transistorised) in 180^0 mode. Also give the relevant circuit diagram and waveforms. 7

OR

8. (a) Draw and explain the parallel inverter with feedback diodes. Also explain how to control the output waveform. 7

(b) What is forced commutation ? Draw and explain the operation of Class 'A' and Class 'B' commutation circuit. 7

9. (a) What is cycloconverter ? Design a 1ϕ to 1ϕ cycloconverter using centre tapped transformer to obtain the output frequency equal to one fifth of the input frequency. 7

(b) What is chopper ? A Chopper circuit is operating on TRC principle at a frequency of 1 KHz on a 220 V DC supply. If the load voltage is 165 V, Calculate the conduction and blocking period of thyristor in each cycle. 6

OR

10. (a) Draw and explain the AC chopper circuit. Also draw the neat waveforms. 6

(b) A step up chopper is required to deliver load voltage of 660 V from a 220 V dc source. If the non conduction time of the thyristor is 100 μses. Calculate the required pulse width. 7

11. (a) What is UPS ? Explain ON-Line UPS with the help of block diagram. 7

(b) Draw and explain the circuit for speed control of DC shunt motor using phase controlled rectifier. 6

OR

12. (a) Draw and explain the fan speed regulator circuit using diac and triac. Also draw the waveforms across load (fan) and triac for firing angle $\alpha = \pi/6$. 7

(b) Draw and explain the soft start circuit. 6