This question paper contains 3 printed pages.]

Your Roll No. .....

1412 **A**

B.Sc. (Hons.)/III

ELECTRONICS – Paper – 3.7(XXI)

(Power Electronics)

Time : 3 *Hours* *Maximum Marks* : 38

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt **Five** *questions in all, including Question No.* **1** *which is compulsory.*

1. (a) Explain why $\frac{\text{कप}}{\text{कज}}$ rating reduces in a SCR with increase in its junction surface area. Suggest an external circuit to protect a SCR against large $\frac{\text{कप}}{\text{कज}}$ 2

   (b) What are the advantages of using SCR as a switch over BJT as a switch ? 2

   (c) Suggest and draw a thyristor based full wave ac control circuit to vary light intensity of a bulb. 2

   (d) What is the advantage of dc series and dc shunt motor over each other ? 2

   (e) Under what conditions a synchronous motor will fail to pull into step ? 2

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2. (a) Using two transistor analogy explain why gate trigger is not required to sustain an SCR in conduction after turning-on. 2

(b) Discuss various methods to turn-on an SCR 3

(c) Draw and describe the turn-on characteristics of SCR 2

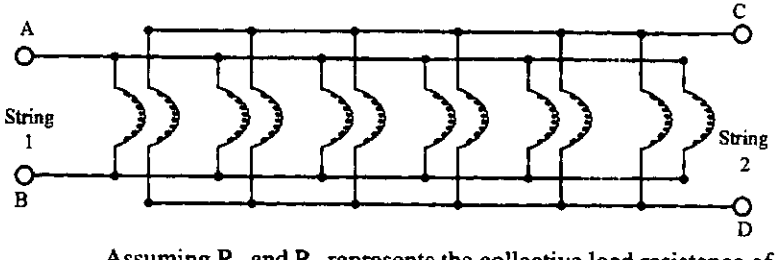
3. (a) Discuss 2 variations of Bridge Rectifier circuit using 2 diodes and 2 thyristors for R-L load. 3

(b) Explain how these circuits can be used to control speed of a dc motor. 3

(c) Which of the two variations is better for inductive load and why? 1

4. (a) Why Commutation Circuits are reaquired in dc power control using SCRs ? 1

(b) Two strings of parallel connected bulbs, arranged as shown below, are required to be turned on alternately to give an impression of running light used for decoration. 6



Assuming R_1 and R_2 represents the collective load resistance of two strings respectively, suggest a SCR based dc commutation circuit to control the switching of 2 strings of bulbs. Explain operation using required waveforms.

5. (a) Explain voltage commutation in a bridge inverter. 2

(b) What are the main limitations of a basic series inverter ? Can all limitations be overcome ? Draw and explain an improved series inverter circuit to overcome possible limitations. 5

6. (a) Draw and explain the torque-slip characteristics of an induction motor at constant frequency. 2

(b) Show and explain the effect of variation in supply voltage and frequency on torque-slip curve. 2

(c) Derive the expression for starting torque in an induction motor. 2

(d) How can the starting torque of a slip-ring induction motor can be improved ? 1

7. (a) Explain how back emf makes a dc motor self regulating. 2

(b) Derive the expression for maximum power developed in a dc motor. 2

(c) Compare a synchronous and an induction motor. 3