This question paper contains 2 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper : **1493**

F-7

Unique Paper Code : **2511701**

Name of Paper : **EL-DC-I-701, Power Electronics**

Name of Course : **B.Tech. Electronics (Erstwhile FYUP)**

Semester : **VII**

Duration : **3 hours**

Maximum Marks : **75**

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

*Attempt **five** questions in all. Question No. 1 is compulsory.*
Use of Scientific Calculator is allowed.

1. (a) Differentiate between *p-n* junction and power diode. 3
   (b) Draw the I-V characteristics of TRIAC. 3
   (c) Explain the principle of operation of chopper circuit. 3
   (d) What is commutation? Why is it required? 3
   (e) Define the forward blocking voltage and reverse blocking voltage of SCR. 3

2. (a) Explain the different trigger methods of Thyristors. 5
   (b) Explain the recursive recovery of power diodes. 5
   (c) Draw the GTO structure and explain its working. 5

3. (a) Explain the basic structure and I-V characteristics of IGBT. 5
   (b) Explain with suitable waveforms the single phase bridge rectification for inductive load. 5
   (c) Explain the switching characteristics of SCR. 5

4. (a) Explain the auxiliary commutation circuit with suitable waveforms. 5
   (b) For class D commutation with SCR turnoff time of 30 μsec, applied bias 50 V and maximum load handling of 50 A, compute the commutating components values. 5
   (c) Explain the working of parallel inverter. 5

5. (a) Explain the working of Morgan chopper. 5
   (b) Compute the values of Jones chopper's commutating capacitor C and transformer inductor L_1 and L_2 for the following data:

$$E_{dc} = 60\ V,\ t_q = 20\ \mu s$$
$$I_{0m} = 140\ A,\ g = 4$$

   (c) If the triggering frequency of SCR is 1 kHz and turnoff time is 0.6 msec, draw the output waveform if the applied bias is 25 V. Also find the average output voltage. 5

P.T.O.

6. (a) Calculate the average and RMS value of output of phase controlled half wave rectifier with input sinusoidal signal ($e = 50 \sin 50\pi t$) at a firing angle of 30°. 5

(b) Explain the working of continuous mode in three phase half controlled rectifiers. 5

(c) Explain the freewheeling diode effect and its application in phase controlled rectifiers. 5

7. (a) What are the demerits of the series inverter? How can they be rectified? 5

(b) Explain the advantages of IGBT over SCR. 5

(c) Explain the working type B chopper circuit.