Printed Pages: 4 EEE-602

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 121603 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-VI) 2015-16

POWER ELECTRONICS

Time : 3 Hours *Max. Marks : 100*

Section-A

1. Attempt all parts of the following : (2×10=20)

(a) What is primary breakdown in semiconductor devices?

(b) Explain the significance of latching and holding current.

(c) What is the difference between voltage and current controlled semiconductor devices?

(d) Define the term commutation.

(e) Enlist different swtiching limits of power BJT.

(f) What is need of series and parallel operation of thyristors?

(g) Discuss the merits and demerits of four quadrant chopper over single quadrant chopper.

(h) Compare natural and forced commutation.

(i) Discuss the applications of ac voltage controllers.

(j) Discuss drawbgacks of cyclo-converter.

Section-B

2. Attempt any five questions from this section. (5×10=50)

(a) Draw the static V-I characteristics of the SCR and explain its modes of operation.

(b) Define *di*/*dt* and *dv*/*dt* ratings of SCR. How is SCR protected against these?

(c) Obtain the expression of input power factor for a single-phase half-wave controlled rectifier feeding a purely resistive load.

(d) With the help of virtical section diagram describe the operation of IGBT, discuss its merits and demerits with respect to other self-commutating power semiconductor devices. What is latch-up in IGBT? How it is avoided?

(e) Calculate the number of SCRs, each with rating of 500 V, 75A required in each branch of a series and parallel combination for a circuit with the total voltage and current ratings of 7.5 kV and 1000 A. Assume derating factor of 14%

(f) Discuss the two transistor analogy of a thyristor. Using this model, describe the various mechanism of turning-on a thyristor.

(g) What is dc chopper? Describer the various types of chopper configurations with appropriate Diagrams.

(h) A single phase full wave ac controller operates from 230 V 50 Hz mains and feeds a resistive load whose value varies between 1.15 ohms and 2.30 ohms. Calculate:

(i) RMS current rating of each SCR

(ii) Average current rating of each SCR

(iii) The maximum load power for $\alpha = \pi/4$

Section-C

Note : Attempt any two questions from this section. (2×15=30)

3. Explain operation of a single-phase fully controlled bridge convertor feeing a highly inductive load. Draw waveforms of output voltage, load current and source current.

4. What are dual converters? Explain the operation of three-phase dual converter using circulating current mode of operations. How are firing angles of two converters controlled?

5. What is pulse width modulation? Explain sinusoidal pulse width modulation used in P.W.M. inverters. What are the advantages of P. W. M. inverters?