

B.Tech.
(SEM. V) ODD SEMESTER THEORY
EXAMINATION, 2016-17
POWER ELECTRONICS

Time : 3 Hours

Max. Marks : 100

Section-A

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

a. What is the basic difference between 'freewheeling diodes' and 'feedback diodes' ?

Ans. Refer Q. 3.3, Page SQ-8A, 2 Marks Questions, Unit-3.

b. State the advantages of power converters.

Ans. Refer Q. 1.10, Page SQ-3A, 2 Marks Questions, Unit-1.

c. Define SCR ratings.

Ans. Refer Q. 2.1, Page SQ-4A, 2 Marks Questions, Unit-2.

d. Why is the reverse breakdown voltage greater than forward breakdown voltage in SCR ?

Ans. Refer Q. 1.5, Page SQ-2A, 2 Marks Questions, Unit-1.

e. Define 'latching current' and explain how is it different from 'holding current' ?

Ans. Refer Q. 1.6, Page SQ-2A, 2 Marks Questions, Unit-1.

f. What is the difference between primary and secondary breakdown in a power transistor ?

Ans. Refer Q. 1.4, Page SQ-1A, 2 Marks Questions, Unit-1.

g. What is meant by quasi saturation ?

Ans. It is the region in which output characteristics differs significantly from its signal level counterpart. In quasi saturation region, base collector junction is forward biased.

h. Explain the need for protection of power devices.

Ans. Refer Q. 2.2, Page SQ-4A, 2 Marks Questions, Unit-2.

i. Define string efficiency and state its significance in case of series and parallel connection of power devices.

Ans. Refer Q. 2.10, Page SQ-6A, 2 Marks Questions, Unit-2.

- j. State and explain the conditions for successful commutations.

Ans: Refer Q. 2.3, Page SQ-4A, 2 Marks Questions, Unit-2.

Section-B

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

2. What are the characteristics of an ideal power switching device? Compare and contrast the characteristics of IGBT and MOSFET.

Ans: Refer Q. 1.18, Page 1-22A, Unit-1.

3. Explain two transistor analogy applied to a thyristor with the help of neat and clean illustrations.

Ans: Refer Q. 1.22, Page 1-27A, Unit-1.

4. On what factors does the di/dt rating of a thyristor depend? What device techniques are used to improve the di/dt rating?

Ans: Refer Q. 2.4, Page 2-6A, Unit-2.

5. Describe with neat diagram the working of a depletion type p -channel MOSFET. Also draw its transfer characteristics.

Ans: Refer Q. 1.13, Page 1-15A, Unit-1.

6. A single phase 230 V, 1 kW heater is connected across a 230 V, 50 Hz supply through a thyristor. Determine the power absorbed by the heater for the firing angle of 45° .

Ans: Refer Q. 3.7, Page 3-10A, Unit-3.

7. Explain the dynamic equalizing circuit for series connected SCRs.

Ans: Refer Q. 2.11, Page 2-18A, Unit-2.

8. Explain the need of commutation in thyristor circuits. What are the different methods of commutation? Explain any one of them with the help of neat and clean schematic and waveforms.

Ans: Refer Q. 2.8, Page 2-10A, Unit-2.

9. What is DC chopper? Describe the various types of chopper configurations with appropriate circuit diagrams.

Ans: Refer Q. 2(a), Page SP-2A, Solved Paper 2013-14.

Section-C

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

10. **What is the need for controlling the voltage at the output terminal of an inverter ? Describe briefly and compare the various methods employed for the control of output voltage of an inverter.**

ANS: Refer Q. 5.9, Page 5-21A, Unit-5.

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

ANS: Refer Q. 3.22, Page 3-32A, Unit-3.

12. **Explain the operation of single-phase fully controlled bridge converter feeding a highly inductive load and draw relevant output voltage and current waveforms.**

ANS: Refer Q. 3.9, Page 3-12A, Unit-3.

