

[Total No. of Questions - 9] [Total No. of Printed Pages - 2]

May-24-0385

EE-302 (Power Electronics-I)

B.Tech. 3rd (CBCS)

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting One question each from section A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) Explain the characteristics of TRIAC with proper diagram. (5)
(b) Explain the series operation of SCRs in detail. (5)
2. Discuss the two transistor model of a thyristor and discuss the operation of thyristor with this model and with relevant equations. (10)

SECTION - B

3. Describe the working of a single-phase full converter in rectifier mode with RLE load. Discuss how one pair of SCRs commutated by incoming pairs of SCRs. Derive an expression for the average output voltage in terms of source voltage and firing angle. (10)
4. With a neat diagram and output waveforms, explain the operation of 3-phase, 6-pulse converter. Derive the expressions for average and RMS output voltage. (10)

SECTION - C

5. Explain the working of operation of 3-phase to three-phase cyclo-converter with relevant circuit and output voltage equation. (10)

2

EE-302

6. Describe the working operation of single-phase to single-phase step-down cyclo-converter with the help of mid-point and bridge types configurations. Illustrate your answer with appropriate circuit and waveforms. The conduction of various SCRs must also be shown in the waveforms. (10)

SECTION - D

7. Discuss the circuit configuration of current commutated chopper. Also derive the output voltage equation and relevant waveforms. (10)
8. (a) Explain the operation of four quadrant chopper operation using Type E Chopper. (5)
(b) Discuss the operation of Step-Up Chopper with relevant equations and waveforms. (5)

SECTION - E (Compulsory)

9. Explain the following:-
 - (i) What do you mean by Forced Commutation?
 - (ii) What do you mean gate triggering and UJT triggering?
 - (iii) Define Pinch Off voltage in MOSFET.
 - (iv) What are the advantages of single-phase bridge converter?
 - (v) What is freewheeling diode and its function?
 - (vi) Discuss the function of firing angle and conduction angle in converter.
 - (vii) What are advantages of six-pulse converters?
 - (viii) What is the basic principle of frequency conversion?
 - (ix) What is circulating type cyclo-converter?
 - (x) What are the types of control strategies in DC choppers? (10×2=20)