[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2064)

14670

B. Tech 4th Semester Examination

Power Electronics (O.S.)

EE-4004

Time : 3 Hours **Max. Marks : 100**

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 from each of the Sections A, B, C & D, and all the subparts of the question in Section E.

SECTION - A

1. (a) What are requirements for series parallel operation of SCRs? What problems do we face for these operations? How are these problems overcome? (14)

   (b) SCRs with ratings of 1000 V and 200 A are used in a string to handle 4 kV and 1500 A. Calculate the number of series and parallel units required in case derating factor is 0.3. (6)

2. (a) How overvoltage and over current protection for an SCR are ensured? (6)

   (b) Classify the different commutation methods for an SCR? Discuss the line and load commutation techniques with circuit diagrams and relevant waveforms. (14)

SECTION - B

3. Discuss different types of ac voltage controllers. A single-phase full-wave ac voltage controller has a resistive load of R = 20 ohm and the input voltage is 230 V, 50 Hz. The delay angles of thyristors are 90°. Determine (i) the rms output voltage (ii) the input power factor (iii) the average current of thyristors. (20)

4. Draw neat circuit diagram of a 3-phase dual converter; explain four quadrant operation of this circuit by drawing waveforms separately for each quadrant. Also, explain clearly the essential requirement for 2nd and 4th quadrant operation. Assume R-L-E load and constant load current. (20)

SECTION - C

5. (a) With the help of a neat circuit diagram, explain the working of Modified Mc Murray full bridge inverter. (12)

   (b) What are fundamental differences between voltage and current source inverters? Also, cite the applications of each type. (8)

6. Write the expressions for instantaneous line and phase voltages, RMS value and fundamental component of line voltage, and THD (both for 120 and 180-degree conduction modes). “The THD content in the output voltage of a 3-phase inverter is less than that of a I-phase inverter”, justify this statement. (20)

SECTION - D

7. Explain the four quadrant operation of a dc chopper with the help of circuit diagrams and relevant waveforms. (20)

8. Explain with the help of circuit diagrams and waveforms, three-phase to single-phase and three-phase to three-phase cycloconverter. (20)

SECTION - E

9. Answer the following questions:

(a) What is an opto-coupler and where is it used?

(b) What do you mean by the protection of an SCR?

(c) Write the output voltage equation for an ac regulator.

(d) The number of pulses produced in the output voltage for 3-phase full and half controlled converter are.....and.....respectively.

(e) Write any two differences between 120° and I80º-modes of conduction of 3-phase inverter.

(f) Write the applications where second and fourth quadrant operations of dc chopper are used.

(g) What do you mean by the voltage commutated chopper?

(h) Is it possible to get output voltage more than the input voltage in case of a dc chopper?

(i) Cycloconverter converts.....power into..... power with the change in.....

(j) Draw the equivalent circuit of single-phase to single-phase cycloconverter. (10×2=20)