

K 1199

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Fifth Semester

Electrical and Electronics Engineering

EE 332 — POWER ELECTRONICS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is commutation? What are the two main types of commutation?
2. Draw the V-I characteristic of SCR and mark the holding current and latching current in the characteristic.
3. What are the advantages of GTO over BJT?
4. What is full converter? What is dual converter?
5. What is the function of free wheeling diode in semi converter?
6. Mention the disadvantages of FM scheme used in choppers.
7. Why is voltage commutated chopper extensively used? Give its disadvantages.
8. List four applications of CSI.
9. List the merits and demerit of ac voltage controller.
10. Mention the advantage and disadvantage of three phase to three phase bridge cycloconverter.

PART B — (5 × 16 = 80 marks)

11. (i) Explain the operation of single phase semi converter and derive the expressions for its average and rms output voltages. (8)
- (ii) Derive the expressions for harmonic factor, displacement factor and power factor of a single phase full converter from the fundamental principle. (8)
12. (a) (i) Explain the switching characteristics of MOSFET. (10)
- (ii) How does the concept of saturation differ in MOSFET with BJT? (6)

Or

- (b) Describe the construction of triac and explain its four different modes of operation with diagrams and characteristics. (16)
13. (a) Draw the circuit diagram of current commutated chopper and explain its operation with five equivalent modes of diagrams. (16)

Or

- (b) (i) Explain the operation of step up chopper and derive an expression for its output voltage. (10)
- (ii) Enunciate the principle of operation of RC firing circuit with aid of circuit diagram. (6)
14. (a) Draw the circuit diagram of modified McMurray half bridge inverter and explain its operation with equivalent circuit diagrams. (16)

Or

- (b) (i) Explain the principle of operation of single phase half bridge inverter. (8)
- (ii) The single phase half bridge inverter has a resistive load of 2.4Ω and the dc input voltage is 48 V. Determine the rms output voltage at the fundamental frequency, output power and the total harmonic distortion. (8)

15. (a) (i) A single phase voltage controller feeds power to a resistive load of 3Ω from 230 V, 50 Hz source. Calculate (10)
- (1) the maximum values of average and rms thyristor currents for any firing angle α .
 - (2) the minimum circuit turn off time for any firing angle α .
 - (3) the ratio of third harmonic voltage to fundamental voltage for $\alpha = 60^\circ$.
- (ii) What are step up and step down cyclo converters? Explain. (6)

Or

- (b) With aid of circuit diagram, explain the operation of three phase to three phase cyclo converter employing three phase half wave circuits and list few of its applications. (16)