Roll No. ..... **Total Pages : 03**

BT-7/M-20 37134

POWER ELECTRONICS

ECE-405N

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each of the four Sections A, B, C and D.

Section A

1. (a) What do you mean by the following terms and write down the purpose of each : **10**

(i) Converter

(ii) Inverter

(iii) Chopper

(iv) Cycloconverter

(v) AC Controller.

(b) What is Power Electronics ? Give some applications of power electronics. What are the advantages and disadvantages of power electronic circuits compared with its electromechanical parts ? **5**

2. Draw the layer structured diagram and explain the brief working of the following : **15**

(a) IGBT

(b) MOSFET

(c) BJT.

Section B

3. (a) With reference to V-I characteristics of a thyristor for different gate currents, define its 'holding current'! 'Latching or pick-up current' and 'repetitive peak inverse voltage' ratings. From the two-transistor analogy, explain the 'OFF' and 'ON' conditions of a thyristor. **10**

(b) What are the mechanisms and methods used to 'turn on' and 'turn-off" a thyristor ? **5**

4. (a) Define, briefly explain and compare natural and forced commutation of thyristors. **10**

(b) Compare GTO and general purpose thyristor. Give typical applications of GTO. **5**

Section C

5. (a) How are the choppers classified ? Show the quadrants of operation of different choppers. Draw their circuits and briefly explain their working. **10**

(b) Explain, with a diagram, how a step-up chopper works. **5**

6. (a) Explain time-ratio and control limit control strategies employed in D.C. choppers, with the circuit diagrams and associated output waveforms. **10**

(b) Explain in brief how average voltage across the load is made more than D.C. supply voltage using chopper. Derive the expression for the average voltage. **5**

Section D

7. (a) Explain the basic principle of operation of a cycloconverter with a neat equivalent circuit diagram. Also, draw and discuss the waveforms illustrating the operation of the idealized cycloconverter circuit with loads of various displacement angles. **12**

(b) What are the applications of cycloconverter ? **3**

8. (a) Explain the operation of a single-phase bridge type step-up cycloconverter (resistive load) with neat sketches. **10**

(b) Briefly explain the operation of a single-phase cycloconverter which accepts 230 V/50 Hz a.c. and provides output voltage at 16.6 Hz. **5**