(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2499 Roll No.

B.Tech.

(SEMESTER-VI) THEORY EXAMINATION, 2012-13

POWER ELECTRONICS

Time : 3 Hours] *[Total Marks : 100*

SECTION – A

1. Attempt **all** question parts. **10 × 2 = 20**

(a) Define latching current and holding current of thyristor.

(b) Why circuit turn off time should be greater than the thyristor turn-off time ?

(c) Write the principle of operation of step up chopper.

(d) Define forced commutation.

(e) Narrate the function of freewheeling diodes in controlled rectifier.

(f) What is commutation angle ?

(g) What is meant by positive converter group in a cycloconverter ?

(h) List out the advantages and disadvantages of AC voltage controllers.

(i) Why diodes should be connected in antiparallel with the thyristors in inverter circuits ?

(j) Differentiate voltage source inverter and current source inverter.

SECTION – B

2. Attempt any **three** question parts. **3 × 10 = 30**

(a) Explain the operation of MOSFET with its.

(i) V-I characteristics

(ii) Switching characteristics

(b) Describe the working of four quadrant chopper.

(c) Illustrate the working of 3-phase semiconverter and derive the expression for average output voltage and rms output voltage.

(d) With the help of neat circuit diagram, explain the operation of 1 phase sinusoidal AC voltage controller.

(e) Explain the operation of 3 phase bridge inverter for 180 degree mode of operation with aid of relevant phase and line voltage waveforms.

SECTION – C

Attempt **all** questions. **5 × 10 = 50**

3. Attempt any **two** parts : **(2 × 5 = 10)**

(a) Draw the two transistor model of SCR and derive an expression for anode current.

(b) Describe the various methods of thyristor turn on.

(c) Explain the operation of IGBT.

4. Attempt any **one** part : **(10 × 1 = 10)**

(a) Explain the operation of voltage commutated chopper with neat diagram and waveforms. Derive expressions for commutating capacitor (C) and commutating inductor (L).

(b) For a current commutated chopper peak commutating current is twice the maximum possible load current. The source voltage is 230 V dc and main SCR turn of time is 30 micro sec. The circuit turn off time is twice device turn off time. For maximum load current of 200 A, calculate :

(i) Values of the commutating inductor and capacitor

(ii) Maximum capacitor voltage

(iii) Peak commutating current

5. Attempt any **one** part : **(1 × 10 = 10)**

(a) Describe the working of 1 phase fully controlled bridge converter in the rectifying mode and inversion mode. And derive the expressions for average output voltage and rms output voltage.

(b) With the aid of neat circuit diagram, explain the working of three phase Dual converter.

6. Attempt any **one** part : **(1 × 10 = 10)**

(a) Explain the operation of single phase to single phase step down cyclo converter with voltage and current waveforms for

(i) Continuous load current

(ii) Discontinuous load current

(b) Describe the operation of multistage sequence control of ac voltage controllers with neat diagram.

7. Attempt any **two** parts : **(2 × 5 = 10)**

(a) Describe the operation of series inverter with aid of diagrams.

(b) Write short notes on PWM control in inverter.

(c) Explain the operation of single phase modified MC Murray half bridge inverter.