

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

PAPER ID : 2499

Roll No.

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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.

$5 \times 10 = 50$

3. Attempt any **two** parts :

$(2 \times 5 = 10)$

- (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 :

$(10 \times 1 = 10)$

- (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 :

$(1 \times 10 = 10)$

- (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.
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