

B.Tech III Year I Semester (R13) Supplementary Examinations June 2017

POWER ELECTRONICS
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

PART - A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- What is holding current in SCR?
 - Define latching current.
 - What causes poor input power factor in phase controlled DC drives?
 - What are the advantages of three phase drives over single phase drives?
 - List the various control strategies for varying duty cycle of the chopper.
 - Write the advantages in operation of choppers at high frequency.
 - What is PWM?
 - List the voltage control techniques for inverters.
 - Write the types of cycloconverters.
 - Write the applications of cycloconverters.

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

- 2 (a) Explain the different modes of operation of thyristor with the help of its V-I characteristics.
(b) Define the following terms with reference to SCR: (i) Peak inverse voltage. (ii) Voltage safety factor.

OR

- 3 (a) Draw the symbol of a thyristor and list the merits and demerits of thyristors.
(b) Draw the switching characteristics of power MOSFETs. Define turn – ON delay time, rise time, turn – ON time, turn – OFF delay time, fall time and turn – OFF time.

UNIT - II

- 4 (a) What are line commutated converters? Explain briefly.
(b) What is half wave converter? Derive the expression for an average DC output voltage of a single-phase half wave converter with R load.

OR

- 5 A single-phase fully controlled bridge rectifier supplies R load. By assuming the constant output current, find the following performance factors if the supply voltage is 230 V and if the firing angle is $\pi/3$ and $R = 5\Omega$. (i) Average output voltage. (ii) Supply RMS current. (iii) Supply fundamental current. (iv) Fundamental power factor. (v) Input power factor. (vi) Voltage ripple factor.

UNIT - III

- 6 (a) Discuss the time ratio control in a dc chopper.
(b) A chopper circuit is operating on time ratio control (TRC) principle at a frequency of 1 kHz on 220 V d.c. supply. If the load voltage is 180 V, calculate the conducting and blocking period of thyristor in each cycle.

OR

- 7 (a) Define chopper. What are the types of chopper? What are the applications of chopper?
(b) A chopper operating on TRC constant frequency principle is feeding a dc series motor having an armature resistance of 0.06 ohm and a field resistance of 0.03 ohm. The average circuit current is 15 A and the chopper frequency is 500 Hz. The back emf of the motor is 100 V. Find the periods of conduction and blocking. The chopper input is 200 V.

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UNIT - IV

- 8 (a) What do you mean by voltage source and current source inverters? Explain the basic operation of a single phase voltage source inverter.
(b) Explain sinusoidal pulse modulation used for PWM inverters and also write its important features.

OR

- 9 What is pulse-width modulation? List the various PWM techniques. How do these differ from each other?

UNIT - V

- 10 (a) Explain the operation of a single phase AC voltage controller with R load and derive all the necessary equations.
(b) Explain the applications of cycloconverter.

OR

- 11 (a) Define the term power factor. Derive its expression for single phase voltage controller feeding a resistive load.
(b) For a single phase midpoint cycloconverter, explain the operation of the circuit when fed to R-load with the help of circuit diagram and relevant output waveforms for $\alpha = 30^\circ$ and $f_0 = f_s/4$.
