

B.E. Etx VIII
(Rev.)

P.E. (Power Electronics) 4/12/107

Con/4928-07.

(REVISED COURSE)

CD-6549

(3 Hours)

[Total Marks : 100

- N.B. : 1) Question No.1 is Compulsory.
2) Attempt any four questions from remaining six questions
3) Figures to the right indicate full marks.
4) Assume suitable data if required.
5) Illustrate answers with sketches wherever required.

1. Explain briefly: (Any Four) 20
- (a) Explain the various types of triggering methods of SCR briefly. Which is the Universal method and Why.
 - (b) What are different performance parameters for controlled rectifiers. Explain their significance.
 - (c) Need for cooling of a Power device.
 - (d) Explain Importance of dv/dt and di/dt ratings along with proper protection circuit in case of SCR.
 - (e) Explain the basic requirements for the successful triggering of Thyristor in detail.
2. (a) Explain the operation of single phase half-controlled bridge converter 10
with resistive load and inductive load with the associated waveforms. Derive the expression for average load voltage, average load current and RMS load voltage.
- (b) A single phase fully controlled bridge converter supplies an inductive 10
load. Assuming that the output current is virtually constant and is equal to I_d , determine the following performance measures, If the supply voltage is 230V and if the firing angle is maintained at $\pi/6$ radians.
- (i) Average output voltage.
 - (ii) Supply RMS current.
 - (iii) Fundamental power factor.
 - (iv) Supply power factor.
 - (v) Voltage ripple factor.
3. (a) Draw and explain the simple SCR series inverter circuit employing 10
Class A type commutation. Draw and discuss the important waveforms. State the limitations of this series inverter.
- (b) Design a series Inverter circuit for operation in the frequency range 10
1 to 5 KHz, the load resistance may vary from 25Ω to 100Ω . The peak load current is limited to 3A and the supply voltage is 100V.
4. (a) With the circuit diagram and output voltage waveforms, explain the 10
principle of operation & working of Jones chopper.
- (b) Design Jones chopper circuit for optimum frequency considerations to 10

meet the following specifications :

Source voltage	$E_{dc} = 200V$
Load current	$I_o = 50A$
	$t_q = 200\mu s$

5. (a) Explain the method of speed control of 3 phase slip ring Induction motor using slip power recovery scheme. 10
- (b) Explain with block schematic the working of microcontroller based control circuit of motor controller. 10
6. (a) Based on either Inverse Cosine or Pedestal and Ramp principle. Suggest a detailed firing circuit to trigger four SCR's of single phase fully controlled bridge converter. Comment on how synchronization, Isolation and phase control is achieved. 12
- (b) Draw and explain the Fan regulator circuit using DIAC and TRIAC. Draw waveforms across load & TRIAC. 08
7. Write short notes: (any Three) 20
- (i) Commutation circuit for SCR
 - (ii) IR compensation.
 - (iii) V/F control for Induction motor.
 - (iv) Effects of source inductance on output voltage of full controlled rectifier.