[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
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17090(N)

B. Tech 3rd Semester Examination

Power Electronics-I (CBS)

EE-302

**Time : 3 Hours** **Max. Marks : 60**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all selecting at least one from each Units i.e. I, II, III & IV. The Unit V is compulsory for all. Assume any missing Data suitably.

## UNIT - I

1. (a) Describe Block Schematic of a General Power Electronics System. State role of each Block. (3)

   (b) Explain Two Transistor Model of a Silicon Controlled Rectifier. State assumptions made. (3+1=4)

   (c) Write any two methods of turn on of Triac? Draw appropriate circuit and waveforms. (5)

2. A resonant pulse commutation ( Class B) is used to supply constant load current of 300A. The value of components of said Class B Commutation circuit has Capacitance (C)=20 microfarads and its circuit inductor has value of 5 micro henry. Assume Initial voltage across capacitance as ( Vs=230 volts). Calculate the peak value of resonant current, its resonant frequency and conduction time for auxiliary thyrister. (12)

## UNIT - II

3. (a) What do you mean by Phase controlled Converter? State assumptions made. (3)





   (b) Explain One pulse single phase controlled converter using R, E series type of load at its output terminals. Derive expressions of Average output voltage, RMS out put current for this converter. Also draw output voltage waveform. (9)

4. (a) SCRs with-peak forward voltage rating of 1000 volts and average on state current rating of 40 Amperes are used in single phase mid point converter and single phase bridge converters. Find the power that these two kind of converters can handle. Use safety factor of 2.5. (6)

   (b) Describe working of a three phase four quadrant Dual Converter.  (6)

## UNIT - III

5. (a) What do you mean by a cyclo-converter? Explain working of a single phase to single phase mid point and bridge type cyclo-converter. (10)

   (b) Why a cyclo-converter is preferred in starting of heavy duty Induction motor drive? (2)

6. Derive output voltage equation of a step up three phase to single phase cyclo-Converter ? Also draw appropriate circuit and output voltage waveforms. (12)

## UNIT - IV

7. Classify various kind of DC to DC Converters. Draw circuit configuration in respect of voltage commutated and current commutated DC to DC converter. Explain their working and draw input voltage vs time, output voltage vs time, output current vs time waveform under forced commutating conditions for a Resistive load. (12)

**[P.T.O.]**

8. (a) A step up / step down chopper has input DC voltage source of 220Volts and out put voltage of 600Volts. If conduction time of thyrister chopper is 100 micro seconds, compute the pulse width of load voltage waveform. (6)

(b) Discuss five applications of Choppers in engineering systems. (6)

## UNIT - V

9. Attempt all parts. Each carry equal marks.

(i) What do you mean by Latching and Holding Current rating of an SCR?

(ii) Why Power MOSFET is superior to Power BJT in UPS systems?

(iii) What is basic difference between steady state and dynamic power rating of thyristers?

(iv) Can a chopper be used for a DC shunt motor speed control applications? How?

(v) Draw circuit symbols of GTO, IGBT power electronic devices.

(vi) How harmonics gets introduced in load currents of phase controlled converters? (2×6=12)