Paper Code: EE502	**Roll No.**									

B.TECH.
(SEM V) ODD SEMESTER EXAMINATION 2016-17
POWER ELECTRONICS

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- ***Attempt All Questions. All Questions carry equal marks*:-**

1. **Answer any four parts of the following:** **5x4=20**
   a) What are the characteristics of an ideal power switching device? Compare the characteristics of IGBT and MOSFET.
   b) Name the different power electronic converters available and list their advantages over conventional modes of conversion and control.
   c) Draw the static V-I characteristics of SCR and explain its modes of operation.
   d) What are the different methods of firing employed for SCR triggering? Explain UJT firing circuit with relevant waveforms.
   e) Define di/dt and dv/dt ratings of SCR. How is SCR protected against these?
   f) In a power circuit 4 SCRs are to be connected in series. Permissible difference in blocking voltage is 20V for a maximum difference in their blocking currents of 10mA. Difference in recovery charge is 10 micro-coulomb. Design suitable equalizer circuit.

2. **Answer any four parts of the following:** **10x2=20**
   a) Discuss the working of single-phase full wave ac-dc converter taking in to account the effect of source inductance. Draw the output voltage waveform for firing angle 30 degree.
   b) A 3 phase full converter is fed by 400 volts, three phase, 50Hz supply. The average load current is 150A and load is highly inductive. For a firing angle of 60 degrees find output power, average, rms and peak current through thyristors and peak inverse voltage.
   c) What are dual converters? Explain operation of a three phase dual converter using circulating current mode of operation. How are firing angles of two converters controlled?

3. **Answer any two parts of the following:** **10x2=20**
   a) Discuss control strategies for operation of choppers. Why is time ratio control (TRC) preferred?
   In a step down chopper feeding a resistive load, the average output voltage is 109V. The voltage drop across the chopper switch when it is ON is 2 V. If the load resistance be 10 ohm and frequency of operation be 2 kHz. For duty ratio of 0.5, calculate:
   (i) DC input voltage to the chopper
   (ii) The rms output voltage
   (iii) Chopper efficiency
   (iv) Input resistance of the chopper.

b) Why does unequal voltage sharing take place among series connected thyristors during steady state and dynamic state? How is equal voltage shaving obtained in both the states?
c) What is DC chopper? Discuss the various types of chopper configurations with appropriate diagrams.

4. Answer any two parts of the following: 10x2=20

a) The resonant pulse commutation circuit has C=30 micro Farad and L=4 micro Henry. The initial capacitor voltage is V_o=200 Volts. Determine T_{OFF} if load current is 250A.
b) Discuss with neat circuit diagram three phase to single phase cyclo converter with R-L load. Also draw the output voltage waveforms.
c) A 220 volts, 25A, 1000 rpm separately excited DC motor has armature resistance 1.5 ohms is controlled by a chopper of 600 Hz and source voltage 230 volts. Calculate duty ratio for rated.

5. Answer any two parts of the following: 10x2=20

a) A 3-phase bridge VSI feeds three-phase star connected resistive load. Obtain the output phase and line voltage if two SCRs conduct at a time.
b) Differentiate between the working of voltage source and current source inverters. Explain the working of a single phase series inverter.
c) Describe forward and reverse speed control of three phase ac voltage controller with relevant circuit diagram. Discuss its merit and demerits.