Roll No .....

MEPS-301(C)

M.E./M.Tech., III Semester

Examination, December 2014

Power Controller (Elective-I)

Time : Three Hours

 Maximum Marks: 70

Note: Attempt any five questions. Each question carry equal marks.

1. a) Why is the cosine firing scheme so popular? Describe a cosine firing scheme for the triggering of thyristor.
   b) Describe how two series connected SCRs are subjected to unequal voltage distribution during their dynamic conditions. Derive an expression for capacitance C used in the dynamic equalizing circuit for n series connected SCRs.

2. a) Draw a circuit diagram illustrating the protection of both anode and gate circuits of an SCR. Describe briefly the function of various components used.
   b) Draw the V-I characteristics of following semiconductor devices and explain them in short.
      i) SCR ii) MOSFET
      iii) IGBT iv) BJT

3. a) A single phase full converter is connected to ac supply of 330 sin 314 t volt. It operates with a firing angle $\alpha = \pi/4$ rad. The total load current is maintained constant at 5A and the load voltage is 140 V. Calculate the source inductance, angle of overlap and the load resistance
   b) Explain the working of single phase dual converter.

4. Describe the effect of source inductance on the performance of 3-phase full converter with the help of phase voltage waveforms. Indicate the sequence of conduction of various thyristors and sketch load current waveforms for both positive and negative group of thyristors. State the various assumptions made. Derive an expression for its output voltage in terms of supply voltage, source inductance, load current etc.

5. a) What is SVC? Describe how SVC regulates the reactive power flow and improves the system power factor Illustrate your answer with relevant phasor diagrams.
   b) What is SMPS? Give its operating principle and industrial applications.

6. Draw the power circuit diagram for a current commutated chopper. Explain the working of this chopper by dividing its commutation process interval into some well defined modes.

7. a) What is pulse width modulation? List the various PWM techniques. How do these differ from each other?
   b) What is the principle of series resonant inverters?

8. a) Explain the 150° mode of VSI.
   b) Explain the working principle of cycloconverter for step up and step down operation.

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