Total No. of Questions :8] *[Total No. of Printed Pages :2*

Roll No.....

MEPE-102

M.E/M.Tech. I Semester

Examination, June 2017

Power Electronics Devices and Phase Control

Time : Three Hours

Maximum Marks : 70

Note: i) Answer any five questions.
ii) All questions carry equal marks.

1. a) List the different members of the thyristor family. Draw their characteristics and explain in brief.
   b) Compare SCR, power BJT, MOSFET and IGBT on the basis of following parameters:
   i) Operating frequency ii) Trigger circuit
   iii) Drop iv) Snubbers
   v) V-I rating vi) Applications

2. a) Explain the basic requirements for the successful firing of thyristor.
   b) What are the different methods for turning off a silicon controlled rectifier and explain in brief with a neat circuit diagram.

3. a) Explain the sequence and sector control method for controlling the output voltage of phase controlled circuits.
   b) Describe a procedure for designing of chopper circuit.

4. a) What are the harmonics reduction techniques? Explain multiple pulse control technique to mitigate harmonics.
   b) Explain the principle of step-up chopper and multiphase chopper with output waveforms.

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5. a) Discuss the single phase dual converter under circulating current conduction mode of operation and derive the expression for inductor voltage.
   b) Describe the operation of multistage sequence control of ac voltage controllers with neat diagram.

6. a) Explain the operation of single phase to single phase step down cyclo converter with voltage and current waveforms for
   i) Continuous load current
   ii) Discontinuous load current
   b) Describe symmetrical and asymmetrical control methods to control the output of cycloconverter.

7. a) Differentiate between the working of voltage source and current source inverters. Explain the working of 1-ϕ full bridge inverter and draw the waveshapes of output-current when:
   i) Load is pure resistive
   ii) Load is pure inductive
   iii) Load is R-L-C under damped
   b) The 1-ϕ quasi-square wave bridge inverter operates from DC supply of 200 V at a frequency of 100 Hz and feeds a resistive load of 10Ω. Calculate
   i) Duration of ON period if the rms value of the load voltage is 100 V
   ii) Peak supply current
   iii) Average (DC) supply current

8. Write a short note on any two of the following:
   i) Protection circuits
   ii) Design of rectifier circuit
   iii) Regenerative braking using phase controlled circuits
   iv) Converter reactions on load side

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