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

Roll No .....

MEPE - 201

M.E./M.Tech., II Semester

Examination, June 2014

Solid State Controllers of Drives

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.
ii) Each question carry equal marks.
iii) Assume suitable data if needed.

1. a) Develop an algorithm used for implementation of firing scheme suitable for single-phase fully controlled rectifier.
   b) Draw circuits of (i) Single-phase semi-controlled rectifier (ii) Three phase semi controlled half wave (iii) Three phase semi controlled full wave rectifier.

2. a) Design a control scheme for a microprocessor controlled. Class-C chopper feeding a separately excited DC motor for motoring and breaking operation.
   b) Draw circuits of type A, B, C, D, E and multiphase chopper.

3. a) In a battery driven truck, the battery voltage is 180V. It employs a DC motor with armature resistance of 0.5Ω through step up chopper. During regenerative braking, when truck is moving downhill at some speed its back emf is 120V and battery current is 20A. Calculate the duty ratio, peak, average and rms current

   b) Draw any two power electronics circuits used for controlling speed of three-phase induction motor.

4. a) Explain slip recovery scheme used for controlling speed of slip ring induction motor.
   b) Draw the block diagram of direct torque control of a VSI fed squirrel cage induction motor drive and state necessary equations used in modeling.

5. a) Describe the vector control scheme of AC drives.
   b) Enlist the advantages of vector control over V/f. Control for AC machines.

6. a) Explain true synchronous mode for wound rotor synchronous machine drive.
   b) A single phase fully controlled bridge converter feeds power to a dc motor having back emf 80V and a resistance of R = 0.5Ω and very large inductance to result in continuous current with an input supply 220V, 50Hz. For firing angle at 60°. Calculate (i) Mean load voltage (ii) Power consumed (iii) Displacement factor (iv) THD.

7. a) Draw circuits of (i) 6-pulse diode bridge rectifier - two level voltage source inverter. (ii) Three-phase PWN rectifier - three level VSI feeding synchronous motor drives.
   b) State and explain various means to reduce energy losses in solid state controlled AC motor drives.

8. Write short notes (any two):
   a) Switch reluctance motor drives
   b) Permanent magnet brushless AC motor drives
   c) Power quality improvement in AC drives.