ED – 754

VI Semester B.E. (E&E) Degree Examination, December 2014/January 2015
(Y2K11 Scheme)
EE 603 : ELECTRIC DRIVES

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **any five full** questions choosing atleast **two** from **each** Part.*

PART – A

1. a) State essential parts of electrical drives with block diagram and mention their function. **5**

   b) Explain what do you understand by steady state stability ? What is the main assumption ? **7**

   c) A drive has following parameters J = 10 kg – m^2, T = 100 – 0.1 N, N – m, passive load torque T_L = 0.05N, N – m. Where N is the speed in rpm. Initially the drive is operating in steady-state. Now it is to be reversed for this motor characteristics in changed to T = – 100 – 0.1N, N – m, calculate the time of reversal. **8**

2. a) Derive an expression for armature voltage and speed during continuous conduction mode of single phase fully controlled rectifier fed separately excited DC Motor. **6**

   b) A 220 V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05Ω . It is braked by plugging from an initial speed of 1000 rpm. Calculate

      i) resistance to be placed in armature circuit to limit braking current to twice the full load value

      ii) braking torque and

      iii) torque when speed has fallen to zero. **8**

   c) Explain the working of chopper control of separately excited DC Motor in motoring mode. **6**

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3. a) From the fundamentals derive the transfer function for a separately excited DC Motor for a step change in load torque. **7**

   b) A 220 V, 1500 rpm, 50 A separately excited motor with armature resistance of 0.5 Ω is fed with a 3-phase fully controlled rectifier. Available ac source has a line voltage of 440 V, 50 Hz. A star delta connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero.

      i) Calculate transformer turns ratio

      ii) Determine the value of firing angle

      when motor is running at 1200 rpm and rated torque ? **8**

   c) With the help of a block diagram explain microprocessor based speed control of three phase induction motor. **5**

4. a) Explain braking by means of plugging in induction motor. **4**

   b) A 3-phase 415 V, 50 Hz, 6 pole star connected wound rotor induction motor speed is controlled by static Kramer Scheme the turns ratio of the converter ac voltage to supply voltage is 0.4 the load torque is 500 Nm at 975 rpm. The turns ratio of the rotor to stator winding is 0.9. If the load torque is proportional to the square of the speed calculate

      i) inductor current Id

      ii) the dc voltage Vd

      iii) the delay angle of the converter α , at 900 rpm. **8**

   c) Explain the operation of 3 phase induction motor with V/f control compare its performance with stator voltage control. **8**

PART – B

5. a) Write a short note on brushless Dc Motor drives. **6**

   b) What is a stepper motor ? What are the main features of a stepper motor ? **6**

   c) What are the various configuration present and advantages of inverter fed synchronous motor ? **8**

6. a) Mention the classes of motor duty for different applications. **4**

   b) Half hour rating of a motor is 100 kW. Heating time constant is 80 min and efficiency occurs at 70% of full load. Determine the continuous rating of the motor. **8**

   c) Determine an expression for the thermal model for heating and cooling. **8**

7. Write short notes on : **(5×4=20)**

   i) Steel rolling mills drives

   ii) Paper industry drives

   iii) Static scherbius drive

   iv) Closed loop speed control for an Ac drive.

8. a) Explain clearly the driving motor used in textile mills. **8**

   b) A 6 kW 3-phase 11 Kv Y connected, 6 pole 50 Hz 0.9 (leading) power factor synchronous motor has Xs = 9 Ω and R_s = 0, rated field current is 50 A. Machine is controlled by variable frequency connected at constant (V/f) ratio up to the base speed and at constant V above base speed. Determine,

   i) Torque and field current for the rated armature current at 750 rpm and 0.8 loading power factor.

   ii) Armature current and power factor for half the rated motor torque at 1500 rpm and rated field current. **12**

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