UJ – 106

VI Semester B.E. (E & E) Degree Examination, June/July 2017
(2K11 Scheme)
EE603 : ELECTRIC DRIVES

Time : 3 Hours Max. Marks : 100

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

PART – A

1. a) State essential parts of a electric drives. What are the functions of a power modulator ? **6**
   b) What are the main factors which decide the choice of electrical drive for a given application ? **6**
   c) Explain what do you understand by the steady state stability ? What is the main assumption ? **8**

2. a) Explain the different operating modes of a dc series motor and separately exited dc motor with its electrical equivalent circuit. **8**
   b) The speed of a 20 hp, 300 v, 1800 rpm, separately excited dc motor is controlled by a three phase full converter drive. The field current is also controlled by a three phase full converter and is set to the maximum possible value. The ac input is a 3ϕ Y connected 208 v, 60 Hz supply. The armature resistance $R_a = 025\Omega$, the field resistance is $R_f = 245\Omega$ and the motor voltage constant is Kv = 1.2 V/A rad/s. The armature and field currents can be assumed to be continuous and ripple free. The viscous friction is negligible. Determine :
      a) The delay angle of the armature converter α_a if the motor supplies the rated power at the rated speed.
      b) The no-load speed if the delay angles are same as in (a) and the armature current at no load is 10% of the rated value.
      c) The speed regulation. **12**

3. a) Explain the principle of regenerative brake control of a separately excited dc motor. **10**
   b) Explain the open loop block diagram of a dc-dc converter fed dc series motor drive. **10**

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4. a) Explain the various method to control the rotor voltage of an induction motor. **10**

   b) A three phase 11.2 kW, 1750 rpm, 460 v, 60 Hz, 4 pole, Y connected induction motor has the following parameters : $R_s = 0.66\Omega$, $R'_r = 0.38\Omega$, $X_s = 1.14\Omega$, $X'_r = 1.71\Omega$ and $X_m = 33.2\Omega$. The motor is controlled by varying both voltage and frequency. The volts/hertz ratio, which corresponds to the rated voltage and rated frequency is maintained constant.

      a) Calculate the maximum torque T_m and the corresponding speed W_m for 60 and 30 Hz.

      b) Repeat (a) if R_s is negligible. **10**

PART – B

5. a) What are the similarities between a brushless dc motor and a conventional dc motor ? Describe the operation of a brushless dc motor drive. **10**

   b) Explain the current source inverter feel synchronous motor drive. **10**

6. a) Explain the constructional details of a switched reluctance motor and design a driver circuit to control the switched reluctance motor. **10**

   b) Obtain the expression for the torque developed in a variable reluctance stepper motor. **10**

7. a) Starting from heat balance equation obtain a relationship between the temperature rise and time. **12**

   b) The temperature rise of an electric motor is 40°C after 1 hour and 60°C after 2 hours. The motor current is 100 A. Determine approximately its final temperature rise when if works on load cycle of 4 minutes working, 8 minutes rest with a current of 125 A. Neglect the effect of iron losses. **8**

8. a) Explain the drive requirements for textile mills. **10**

   b) Explain the drive requirements for paper mills. **10**

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