

FACULTY OF ENGINEERING
B.E. 4/4 (E & EE) I Semester (Main) Examination, December 2011
ELECTRIC DRIVES AND STATIC CONTROL

Time: 3 Hours]

[Max. Marks: 75

Note : Answer all questions from Part A, answer any five questions from Part B.

PART – A



(25 Marks)

1. Mention atleast four factors for the selection of electric drive. 2
2. What are the characteristics of different types of loads ? 2
3. The energy dissipated in case of dc series motor is independent of armature resistance. State whether this is true or false. Substantiate it. 3
4. List the factors on which the size and rating of a motor depends upon for a particular application. 3
5. Draw the family of speed-torque characteristics of single phase fully controlled rectifier fed DC motor. 3
6. What are the four quadrants of DC drive ? 2
7. What is the function of Static Kramer system ? 2
8. Why the power factor of the slip power recovery scheme of speed control of induction motor is low ? 3
9. What are the characteristics of self controlled mode operated synchronous motor ? 3
10. What are the ways of receiving firing pulses in self control mode ? 2

PART – B

(50 Marks)

11. a) Explain briefly about multi quadrant operation of a drive with illustrations. 5
 b) A 250 V dc series motor drives a fan, the load torque being proportional to the 1.5th power of the speed. At a certain speed, the motor takes 40A. The machine resistance is 0.6Ω. Find the extra resistance needed to reduce the speed to one half of the original speed, saturation may be ignored. 5
12. a) Give a brief description of braking methods employed for synchronous motor. 5

- b) Determine the time required to bring to rest, by reverse current braking, a load of M.I. of 10kg-m^2 from a speed of 950 rpm by means of 440 V, 6 pole 50 Hz stator connected 3- ϕ I.M. having the following parameters :

$$R_1 = 0, R_2 = 0.2 \Omega ;$$

$$X_1 = X_2 = 0.5 \Omega ;$$

What resistance/phase must be added to the rotor circuit to bring the motor to rest in the quickest possible time and calculate this minimum time. 5

13. Describe the operation of single phase fully controlled rectifier control of dc separately excited motor and obtain the expression of motor speed for continuous and discontinuous modes of operation. 10
14. a) Bring out merits and demerits of Scherbius drive. 5
 b) At 50 Hz the synchronous speed and full load speed are 1500 rpm and 1370 rpm respectively. Calculate the approximate value of speed for a frequency of 30 Hz and 80% of full load torque for inverter fed I.M. drive. 5
15. a) What are the modes of speed control of synchronous motor ? 5
 b) A 3- ϕ , 400 V, 50 Hz, 6 pole, star connected round rotor synchronous motor has $Z_s = (0 + j2)\Omega$. Load torque, proportional to speed squared is 340 N-m at rated synchronous speed. The speed of the motor is lowered by keeping V/f constant and maintaining unity power factor by field control of the motor. For the motor operation at 600 rpm, calculate :
 a) Supply voltage
 b) Armature current
 c) Excitation angle
 d) Load angle
 e) Pull-out torque.
 Neglect rotational losses. 5
16. a) Discuss various methods of starting of electric motors. 5
 b) Explain briefly about the braking methods of AC and DC motors. 5
17. Give a brief treatise on the following : 5
 A) Switched reluctance motor. 5
 B) Brushless DC motor. 5