Code No. 2061

FACULTY OF ENGINEERING

B.E. 4/4 (EE/Inst.) I – Semester (Main) Examination, November/December 2012

Subject: 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. State the most important parts of electric drives. (2)
2. Compare dc drives with AC drive atleast in four aspects. (2)
3. Explain the consequences of using a motor of wrong rating. (3)
4. What are the factors that influence the size and rating of a motor for a particular application? (3)
5. What factors limit the maximum speeds of the field controlled dc motors. (3)
6. Why CSI fed induction motor drive is operated at constant rated flux. (3)
7. Give two applications of switched reluctance motors. (2)
8. Classify the synchronous motor based on their control. (2)
9. Draw the modified speed – Torque characteristics of dc series motor. (3)
10. What are the various methods of speed control of induction motors? (2)

PART – B (50 Marks)

11.(a) Illustrate all the possible cases of the load torque and motor torque with torque on x-axis and speed on y-axis in order to determine the stability of each case. (5)

(b) A drive has the following parameters: J = 10 Kg.m^2; T = 15 + 0.05 N; N-m and T_l=5 + 0.06 N; n-m where N is the speed in rpm. Initially the drive is working in steady state. Now the drive is braked by electrical braking. Torque of the motor in braking is given by T = -10 – 0.04N; N-m calculate the time taken by the drive to stop. (5)

12.(a) Explain clearly about constant – torque drive and constant – power drive. (5)

(b) A 220 V, 20 kW DC shunt motor running at its rated speed of 1200 rpm is to be braked by reverse current braking. The armature resistance is 0.1 ohm and the rated efficiency of the motor is 88%. Calculate
(i) The resistance to be connected in series with the armature to limit the initial braking current to twice the rated current.
(ii)The initial braking torque. (5)

13.(a) State and explain the important features of various braking methods of dc motors. (5)

(b) A three phase fully controlled bridge rectifier is fed from a 3-ph balanced supply at 400 V and 50 Hz. The load consists of R=15Ω and a large smoothing inductance causing a perfect smoothing. Determine the average value of the load voltage, current and power dissipation for a firing angle of $\alpha = 75^o$. Assume the thyristor and supply to be ideal. (5)

14.(a) Illustrate with neat sketches by highlighting the salient features of the slip power recovery schemes of three phase induction motors. (6)

(b) What are the advantages and disadvantages of slip controlled drive? (4)

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15. Explain in detail about BLDC motor (Construction, operation of unipolar and bipolar, applications). (10)

16. A 6 MW, 3-phase, 11 KV, y-connected, 6 pole, 50 Hz, 0.9 (leading) power factor synchronous motor has $X_s = 9\Omega$ and $R_s = 0$; rated field current is 50A. Machine is controlled by variable frequency control at constant (v/f) ratio upto the base speed and at constant V above base speed. Determine (10)

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

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

    iii) Armature current and power factor for regenerative braking power output of 4.2 MVA at 750 rpm and rated field current.

    iv) Torque and field current for regenerative braking operation at rated armature current, 1500 rpm and upf. (10)

17. Give a brief treatise on the following:
    (i) Load equalization (5)
    (ii) Switched reluctance motor (5)

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