[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2066)

16127(J) June-16

B. Tech 6th Semester Examination

Electrical Drives and FACTS (NS)

EE-324

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions. Select one question from each of the section A, B, C and D. Question no. 9 in Section E is compulsory. All questions carry equal marks.

SECTION - A

1. (a) Explain the transient stability of an electric drive. How it is improved? What is the role of load equalization in the performance of electric drive? (10)

   (b) State essential parts of electric drives. What are the functions of power modulator? (10)

2. A motor equipped with a flywheel has to supply a load torque of 600 N-m for 10 seconds followed by a no load period long enough for the flywheel to regain its full speed. It is derived to limit the motor torque to 459 N-m. What should be the moment of inertia of the flywheel? The no load speed of the motor is 600 r.p.m. and it has a slip of 8% at torque 400 N-m. Assume the motor speed torque characteristic to be straight line in the range of operation. Motor has inertia of 10kg-m^2. (20)

SECTION - B

3. (a) The temperature rise of a motor when operating for 25 min on full load is 25°C and Becomes 40°C when the motor operates for another 25 min on the same load. Determine heating time constant and steady state temperature rise. (10)

   (b) Explain the operation of a closed loop position control scheme. What are the role of inner current control and speed control loops? (10)

4. (a) Describe the regenerative braking of a chopper-fed separately excited DC motor. Illustrate answer with circuit diagram and relevant waveforms. (10)

   (b) A 220 V, 1200rpm, 15A, separately excited DC motor has armature resistance and inductance of 1.8 ohm and 32 mH respectively. This motor is controlled by single phase fully controlled rectifier connected to an AC source voltage of 230V, 50Hz. Identify the modes and calculate developed torque for:

   (i) $\alpha = 45°$ and speed = 450 r.p.m.

   (ii) $\alpha = 60°$ and speed = 1500 r.p.m. (10)

SECTION - C

5. (a) Explain the method of controlling induction motor using cycloconverter. (10)

   (b) A 3 phase 4 pole, 415 V, 50 Hz induction motor has a star connected stator. The rotor impedance at standstill is 0.1+j0.9Ω. The stator to rotor turns ratio is 1.75. Calculate the external resistance per phase required in the rotor to limit starting rotor current to 60 A, using rotor resistance starter. (10)

6. Draw and explain the operation of three phase brushless DC motor drive. Also, explain the related waveform. (20)

SECTION - D

7. What is series capacitor compensation? What are the relative advantages and disadvantages? Analytically compare between the series and shunt compensation of transmission line. (20)

8. Explain the principle of operation and VI characteristics of STATCOM with neat sketch. (20)

SECTION - E

9. (a) What are the factors influencing the choice of electric drives?

   (b) What is meant by periodic intermittent duty?

   (c) What are the advantages of electric drive over mechanical drive?

   (d) What is the main reason of fitting fly-wheel alongwith the motor?

   (e) What are the advantages and disadvantages of Electrical Braking?

   (f) What are the factors influencing the selection of starters?

   (g) Why Chopper based D.C drives give better performance than rectifier controlled drives?

   (h) What is meant by AC Voltage controller?

   (i) How is reactive power controlled in the electrical network?

   (j) What are the advantages of FACTS controllers?

(10×2=20)