EE82

USN ☐☐☐☐☐☐☐☐☐☐

NEW SCHEME

Eighth Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Electrical and Electronics Engineering
Industrial Drives and Application

Time: 3 hrs.]   [Max. Marks:100

Note : *1. Answer any FIVE full questions.*
2. Draw neat sketches wherever necessary.

1   a. What are the relative advantages and disadvantages of AC and DC electric drive?
                                                                                    (06 Marks)
    b. Classify electric drive. Discuss the merits and demerits of individual and group drive.
                                                                                    (06 Marks)
    c. A 400 V, 15 kW DC shunt motor takes 42 A and runs at a speed of 1200 rpm. The shunt field has a resistance of 200 Ω. Neglect rotational losses and armature reaction. What value of external resistance must be included in the field circuit, if it is desired to raise the speed to 1500 rpm under the following conditions:
       i)   The load torque remains constant at different speeds.
       ii) The power remains constant at different speeds.   **(08 Marks)**

2   a. With necessary diagrams and curves explain modified speed-torque characteristics of DC shunt motor.   **(06 Marks)**
    b. Explain the four quadrant operation of a motor driving a hoist load.   **(06 Marks)**
    c. A 3 phase, 440 V, 50 Hz, 110 kW, 24 pole, 245 rpm slip ring induction motor has its stator and rotor windings connected in star. The ratio of stator to rotor turns is 1.25. The resistance measured between each pair of slip rings is 0.04 Ω. This motor drives a fan which requires 110 kW at the F.L speed of the motor. The torque required to drive the fan varies as the square of the speed. What resistances should be connected in series with each slip ring so that the fan will run at 175 rpm? Neglect stator impedance and rotational losses of the motor.   **(08 Marks)**

3   a. Describe in detail DC and AC dynamic braking as applied to I.M.   **(10 Marks)**
    b. A 230 V, three phase, 50 Hz four pole delta connected cage induction motor has the following equivalent circuit parameters per phase $r_1 = 0.13$ Ω, $r2 = 0.32$ Ω, $x_1 = 0.6$ Ω, $x_2 = 1.48$ Ω, $r_m = 250$ Ω, $x_m = 20$ Ω. The full load slip is 5%. The effective stator to rotor turns per phase $= \dfrac{1}{1.57}$. The machine is to be braked by plugging. Determine the initial plugging torque and the total braking torque, when plugging is applied. Neglect mechanical losses and use the approximate equivalent circuit.   **(10 Marks)**

4   a. Explain the dynamic behaviour of DC shunt motor (or separately excited motor) with the aid of the transfer function and block diagram representation.   **(10 Marks)**

b. Determine the equation of motion of the drive system consisting of a motor, a single gear train, an inertia torque, a hoist load, a dry friction load, a viscous friction load and a fan load as shown in Fig. 4(b) below.
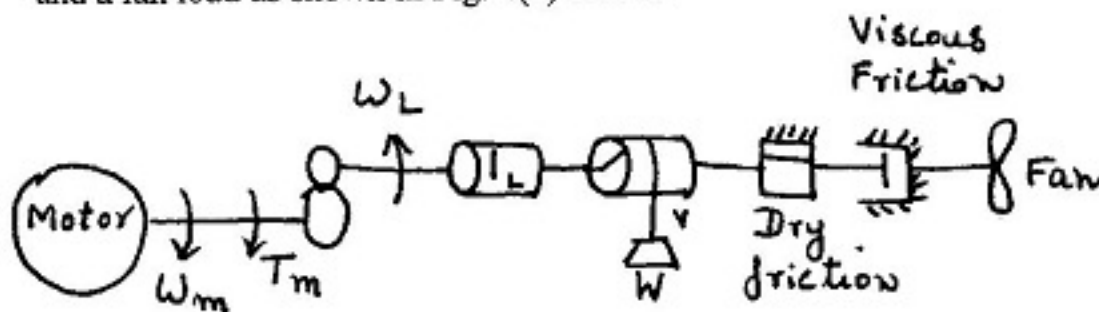

Fig. 4(b)   (10 Marks)

5 a. Explain how to determine heating time constant graphically.   (06 Marks)

b. A motor has a thermal heating time constant of 45 min. When the motor runs continuously on F.L, its final temperature is 80^0C.
   i) What would be the temperature rise after 1 hr, if the motor runs continuously on full load?
   ii) If the temperature rise on 1 hr rating is 80^0C, find the maximum steady state temperature at this rating.
   iii) How long will the motor take for its temperature to rise from 50^0C to 80^0C, if it is working at its 1 hr rating.   (08 Marks)

c. Select the motor for driving the equipment which has the load torque curve as below
   i) For the first 10 secs the torque is constant and equal to 41 kgm
   ii) For the next 30 secs the torque drops linearly with time from 38 kgm to 17 kgm.
   iii) For the last 46 secs the torque is constant and equal to 8 kgm.   (06 Marks)

6 a. Explain the different process involved in rolling mills.   (10 Marks)
  b. What are the requirements of paper machine drive?   (10 Marks)

7 a. Derive the expression for the total tractive effort.   (06 Marks)
  b. Explain the speed-time curves of an electric train.   (06 Marks)
  c. A 200 tonne motor coach having 4 motors, each developing 6000 Nm torque during acceleration starts from rest. If up gradient is 30 in 1000, gear ratio 4, gear transmission efficiency 90%, wheel radius 45 cm, train resistance 50 N/tonne, addition of rotational inertia 10%, calculate time taken to attain speed of 50 kmph. If line voltage is 3 kV DC, and efficiency of motors 85% find the current taken during notching period.   (08 Marks)

8 Explain any four from below :
  a. Advantages and disadvantages of electric traction.
  b. The braking methods as applied to DC series motor
  c. Different types of load torques.
  d. Heating and cooling curves of an electric drive.
  e. Continuous, intermittent and short time rating of electric drive.   (20 Marks)