

Electrical Drives & Their Control

P. Pages : 2

Time : Three Hours



TKN/KS/16/7479

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data wherever necessary.

1. a) What are the basic requirements of electrical braking ? Explain rheostatic braking of induction motor. **6**
 - b) A 4-pole, 50Hz, slip ring induction motor has rotor resistance and stand still reactance ref. to stator is $0.2\ \Omega$ and $1\ \Omega$ per phase respectively At full load it run at 1440rpm. Determine the value of resistance to be inserted in rotor in Ω/ph to operate at a speed of 1200rpm load torque remain constant. Neglect stator resistance & reactance. **7**
- OR**
2. a) Discuss starting and running characteristics of D.C. Motors. **6**
 - b) A 2-pole series motor runs at 707 rpm when taking 100A at 85volts and with the field coils in series. **7**
The resistance of each coil is $0.03\ \Omega$ and that of the armature $0.04\ \Omega$. If the field coils are connected in parallel and load torque remains constant, Find
 - a) Speed
 - b) The additional resistance to be inserted in series with the motor to restore the speed to 707 rpm.
3. a) Discuss different factors governing selection of motors. **6**
 - b) A certain motor has to perform the following duty type. **7**
100HP for 10 minutes
NO LOAD for 5 minutes
60HP for 8 minutes
NO LOAD for 4 minutes
Which is repeated indefinitely. Determine the suitable size of continuously rated motor.
- OR**
4. a) A 6-pole, 50Hz, induction motor has a flywheel of $1200\ \text{kg-m}^2$ as moment of inertial. Load torque is 100kg in for 10 secs. No load period is long enough for the flywheel to regain it's full speed. Motor has a slip of 6% at a torque of 50Kg-m Find:
 - i) Maximum torque exerted by the motor
 - ii) Speed at the end of deceleration period**8**
 - b) Explain the flywheel effect used in load equalization. **5**

5. a) What are the advantages of using PLC in industry ? Hence explain ladder programming in PLC ? 8
- b) Explain the working of a PLC with a block diagram. 6
- OR**
6. Write short notes on :
- i) RMS rating of electrical motor. 4
- ii) Types of drives. 5
- iii) Difference between PLC's and personal computer. 4
7. a) Discuss blow out structure of contractor. Also compare AC and DC contactors. 7
- b) What are the different methods of acceleration control of DC shunt motor ? Explain any one method with circuit diagram. 7
- OR**
8. a) Explain star-delta starting of 3- ϕ induction motor using contractors with the neat diagram. 7
- b) Explain control and power circuit of pole changing of 3- ϕ induction motor. 7
9. a) Draw and explain speed time curve of. 6
- i) Main line service ii) Urban service
- iii) Suburban service
- b) Explain the effect of unequal wheel diameter on parallel operation of DC shunt and series motors for traction application. 7
- OR**
10. a) An electric train has an average speed of 42 km/hr on a level track between stops 1400m apart. It is accelerated at 1.7 kmphs and is braked at 3.3 kmphs. 7
- Draw the speed time curve for the run. Estimate the energy consumption at the axles of the train per tonne/km. Take tractive resistance constant at 50NW per tonne and allow 10% for rotational inertia.
- b) An electric train is to have acceleration and braking retardation of 0.8 km/hr/sec and 3.2 km/hr/sec respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 sec. Find schedule speed for a run of 1.5km. Assume simplified trapezoidal speed time curve. 6
11. a) Draw block diagram of digital control system and write flow chart of the program. 7
- b) Compared analog and digital control of electric drives. 6
- OR**
12. a) Which motors are required for following drives ? Explain the reason in brief. 8
- i) Rolling Mills. ii) Cranes & Hoist work.
- iii) Refrigeration & air conditioning. iv) Paper Mills.
- b) Discuss control panel design. 5
