

Electrical Drives & Their Control

P. Pages : 2

NIR/KW/18/3475

Time : Three Hours

1258

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.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

- 1.** a) Compare regenerative braking in case of AC and DC Drives. **6**
- b) A 2 pole series motor run at 707 rpm. When taking 100 A at 85 V and with the field coils in series. The resistance of each field coil is 0.03Ω and that of the armature 0.04Ω . If field coils are connected in parallel and load torque remain constant, find **7**
- 1) Speed
 - 2) The additional resistance to be inserted in series with the motor to restore the speed to 707 rpm.
- OR**
- 2.** a) List out the different methods of starting three phase Induction motor and explain any one of them with neat diagram. **6**
- b) A 30 HP, 500V, 4-pole, 50 Hz cage type Induction motor with mesh connected stator takes a full load current of 33 amperes and has a slip of 4%. The impedance per phase is 3.5Ω . Calculate the starting torque and starting current taken from the supply if the motor is started by. **7**
- i) Direct switching.
 - ii) Star – delta starter.
 - iii) A star – connected Auto – x^{mer} with 60% tap.
- 3.** a) Discuss the significance of 'Heating and cooling curve' for selection of motor rating and also explain RMS horse power rating. **7**
- b) A Motor of 25 HP with a heating time constant of 100 minutes has a temperature rise of 40°C on continuous rating. Find the half hour rating of the motor for this temperature rise assuming that it cools down completely between each load period. The motor has maximum efficiency at 85% of it's full load. **6**
- OR**
- 4.** a) What do you mean by load equalization and explain the effect of flywheel. **5**
- b) The following data refers to a 500 HP. rolling mill induction motor equipped with a flywheel; No-load speed = 40 rpm, Slip at full load – 12%, Load torque during actual rolling = 41500kg, Duration of each rolling period = 10sec. Determine the inertia of the flywheel required in the above case to limit the motor torque to twice its full load value. **8**

Neglect the NO LOAD losses and assume that the rolling mill torque falls to zero between each rolling period. Assume that the motor slip is directly proportional to torque.

5. a) Draw block diagram of PLC and explain function of each block. **8**
b) State the Advantages and application of P.L.C. **6**

OR

6. a) What is ladder. diagram with reference to PLC programing? **7**
b) List four tasks performed by PLC – input module / output module. **7**

7. a) Explain the construction of D.C. contactor? Explain the fundamental difference between an AC and DC contactor. **7**
b) Describe in brief any one method for the control of acceleration of armature of d.c. shunt motor, give circuit diagram. **6**

OR

8. a) Draw and explain with the help of neat circuit diagram, how will you achieve dynamic braking of 3Φ squirrel cage induction motor. **6**
b) Draw and explain the power and control circuit for speed control of 3Φ induction motor using pole changing method. **7**
9. a) Explain the speed time curve of train for main line service. **6**
b) Explain the effect of unequal wheel diameter on operation of d.c. shunt and series motor for traction application. **8**

OR

10. a) Define the terms: **6**
i) Crest speed ii) Schedule speed iii) Average speed
What are the factors affecting schedule speed.
b) A multiple unit train is equipped with 6 motors which operate at a line voltage of 600 volts. Each motor takes an average current of 200 Amp. During series parallel starting. The full line voltage is applied to each motor. When the speed reaches 40 km/hr. Assuming uniform acceleration of 1.5 km/hr/sec, determine the energy supplied during the starting period, the energy lost in the starting resistance and the useful energy supplied to the train. Each motor has resistance of 0.15Ω using the simplified speed time curve, derive an expression for the maximum. **8**

11. a) Give the advantages and disadvantages of digital control of electric drives. **6**
b) Draw the block diagram of digital control and write flow chart of the program. **7**

OR

12. a) Give the adequate reasons and explain the type of motor used for the following. **8**
i) Rolling mills. ii) Cranes and hoist.
iii) Punching and shears. iv) Refrigeration and air conditioning.
b) Write short notes on Control Panel Design. **5**
