B.E. (Electrical Engineering (Electronics & Power)) Sixth Semester (C.B.S.)

Electrical Drives & Their Control

P. Pages : 2 **NRJ/KW/17/4530**

Time : Three Hours *0125* 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. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain classification of electrical drives in brief with their a advantages and disadvantages. **8**

b) The full voltage starting current of a 400 V, 50Hz, star connected motor is 5 times the full load current and the starting torque is 2 times the full load torque. Calculate - **6**
i) Motor current per phase, ii) Current from the supply, iii) the starting torque when the motor is started by an auto transformer with 65% tap.

OR

2. a) Explain the difference between regenerative braking and dynamic braking. How will you apply dynamic braking to a dc series motor? **8**

b) The speed of a 15 HP, 400V dc shunt motor is to be reduced by 20% by placing a resistor in the armature circuit. The field current is 3A and the armature resistance is 0.5Ω Determine ohmic value of the resistor. Assume that the motor operates at constant torque and has an efficiency of 85% **6**

3. a) What is RMS horsepower rating? How to calculate it? **8**
A motor has to expert power starting from zero and rising uniformly to 150 HP in 8 minutes after which it works at constant power of 100 HP for 5 minutes. The motor remains on no load for next 5 minutes. The cycle again starts and repeats indefinitely. Determine suitable size of motor.

b) A motor fitted with a flywheel supplies a load of torque 1000 N-m for 2 seconds. During no load period the flywheel regains its original speed. The motor torque is required to be limited to 500N-m. Determine moment of inertia of flywheel. The no load speed of motor is 500 rpm and its full load slip is 10% **5**

OR

4. a) Derive the expression for motor torque when load is increasing or flywheel decelerates. **7**

b) A 25Hp motor with heating time constant of 100 minutes has final temperature of 40ºC on continuous rating. Find half hour rating for this temperature rise, assume that motor cools down completely between each load period. The motor has maximum efficiency of 85% of its full load. **6**

5. a) How does a PLC based system differ from micro-processor based control system? **6**

b) Write short note on PLC programming. **7**

OR

6. a) Explain with suitable example the PLC programming using ladder diagram. **6**

b) Discuss the use of PLCs for electric drives. **7**

7. a) Explain the different contactor ratings defined by NEMA. **6**

b) Draw and explain with the help of neat circuit diagram, how will you achieve dynamic braking for s phase induction motor. **7**

OR

8. a) Compare the construction of electromagnet for AC and DC contactors. **6**

b) Explain magnetic blow out structure in DC contactor. **7**

9. a) Draw and explain the speed time curve for train movement. **6**

b) What is shunt transition and Bridge transition? **8**

OR

10. a) Efficiency of starting has increased from 50% in case of plain rheostatic method to 66.7% for series parallel method' comment. **8**

b) A 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 stop 26 seconds. Find schedule speed for sure of 1.5 km. Assume simplified trapezoidal speed time curve. **6**

11. a) Compare analog and digital control of electric drives. **5**

b) State the requirements & mention the drives commonly used in following applications. **8**

i) Pump

ii) Conveyors

iii) Rolling mills

iv) Air conditioners

OR

12. a) What are the advantages of digital control of electric motor? **6**

b) Explain with the help of diagram digital control of electric drives. **7**

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