Roll No. : _____

National Institute of Technology, Delhi

Name of the Examination: B.Tech

Branch: EEE
Course Name: Electrical Drives
Time: 2:00 Hrs

Semester: VII
Course Code: EEB 401
Maximum Marks: 25

SECTION-A

1. Attempt all parts : **(2 x 3=6)**

(a) Draw block diagram of an electric drive and explain each component in brief.

(b) Enlist the advantages of using electric drives.

(c) Derive the fundamental torque equation with a help of a necessary diagram.

SECTION-B

2. Attempt all parts: **(4+3+3 = 10)**

(a) Explain the four quadrant operation of an electric drive in detail. **(4)**

(b) A motor equipped with a flywheel is to supply a load torque of 1000N-m for 10sec followed by a light load period of 200N-m long enough for the flywheel to regain its steady state speed. It is desired to limit the motor torque to 700N-m. what should be the moment of inertia of flywheel? Motor has an inertia of 10 Kg-m^2. It's no load speed is 500rpm and the slip at a torque of 500 N-m is 5%. Assume speed-torque characteristic of motor to be a straight line in the region of interest. **(3)**

(c) A motor operates on a periodic duty-cycle in which it is clutched to its load for 10 min and declutched to run on no-load for 20 mins. Minimum temperature rise is 40^0 C. Heating and cooling time-constants are same and have a value of 60 mins. When load is declutched continuously the temperature rise is 15^0 C.

Determine:

(1) Maximum temperature during duty cycle.

(2) Temperature when the load is clutched continuously. **(3)**

SECTION-C

3. Attempt any ONE part from the following: **(9 x 1 = 9)**

(a) i) Describe the various classes of motor duty in detail with the necessary graphs. **(5)**

ii) A 2-pole separately excited DC motor has the ratings of 220V, 100A and 750rpm. Resistance of the armature is 0.1Ω. The motor has two field coils which are normally connected in parallel. It is used to drive a load whose torque is expressed as T_L=500-0.3N, N-m where N is the motor speed in rpm. Speeds below and above rated are obtained by armature voltage control and by connecting the two field windings in series respectively. Calculate the motor armature current and speed when the armature voltage is reduced to 110V. **(4)**

OR

(b) i) Determine the approximate motor rating for

1. Continuous duty
2. Short- time duty **(5)**

ii) Half hour rating of motor is 100KW. Heating time constant is 80 min and the maximum efficiency occurs at 70% full load. Determine the continuous rating of the motor. **(4)**