Printed Pages : 6 | 708 | EEE-035/EEE-702

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 120754/ 121702 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VII) THEORY EXAMINATION, 2015-16

ELECTRIC DRIVES

[Time:3 hours] **[Total Marks:100]**

SECTION-A

1. Attempt **all** parts. All parts carry equal marks.(2×10=20)

   (a) Differentiate between "group drive" and individual drive".

   (b) Why a motor smaller rating can be selected for a short time duty?

   (c) A motor is couples to a load having the following characteristics:

   Motor : T_m=15-0.5 ω_m

   Load: $T_{1=0.5}\ \omega^2_m$

   (d) Enumerate different types of braking of dc motor. Which one is usually employed and why?

(e) What is the function of Power modular in an electric drive?

(f) Why DC series motor is more suited to deal with torque overloads than other DC motor.

(g) Why the V/f is kept constant while controlling the speed of a 3-phase induction motor?

(h) What are the disadvantages of dc drives due to which the three-phase induction motor drive is replacing it?

(i) Why half-wave converter is not used for supply to the field circuit of dc motor?

(j) What do you mean by Load Equalization?

SECTION-B

Attempt **any five** question from this section. (10×5=50)

2. A drive has following parameters: $J=10 kg.m^2$, $T=15+0.05N$, N-m and $T_l=5+0.06N$, N-m, where N is the speed in rpm. Initially drive is working in steady State. Now the drive is braked by the electric braking. Torque of the motor in braking is given by $T=10-0.04N$, N-m. Calculate time taken by the drive to stop.

3. (a) What is heating time constant? Explain how the rating of motor is affected by the temperature rise of Electric Motor.

(b) A motor has a heating time constant of 60 min and a cooling time constant of 90 min. When run continuously on full load of 20 kW, final temperature rise is 40°C. What load can be delivered by the motor for 10 min if the initial temperature rise is zero?

4. Describe self controlled and load commutated inverter controlled synchronous motor drive and compare them.

5. (a) A 220 V, 970 rpm separately excited motor having an armature resistance of 0.05 Ω draws 100 A from the source. The motor is to be braked by plugging from an initial speed of 1000 rpm. Calculate : (i) the resistance to be connected in series with armature to limit the initial braking current to twice the rated current (ii) initial braking torque (iii) the braking torque when the speed has reduced to zero.

(b) Explain dynamic braking of three phase induction motor.

6. A three phase fully controlled bridge converter is feeding a separately excited dc motor. Assuming continuous load current, derive the equation relating speed and torque of the motor as a function of triggering delay 'α'.

7. Explain stator voltage control of three phase induction motor. Why this control is suitable for fan and pump drives?

8. Discuss the problem arising in the operation of impact load. Explain, with the help of diagram, how these problems are minimized using fly wheel.

9. Based on the rms torque, estimate the kW rating of 750 rpm motor used for driving equipment having the following load torque curve:

   (i) For first 10 seconds, the torque is constant at 40 kg-m;

   (ii) For next 30 seconds, the torque varies linearly with time from 35 kg -m to 15 kg-m;

   (iii) For the last 50 seconds, the torque is constant and equal to 10 kg-m.

SECTION-C

Attempt **any two** questions from this section. (15×2=30)

10. (a) Perform the transient analysis of separately excited DC motor started using armature control scheme.

    (b) A motor drives two loads one has rotational motion. It is coupled to the motor through a reduction gear of teeth ratio a=0.1 and efficiency as 90%. The load has a moment of inertia of 10 kg-m^2 and a torque of 50 N-m. Other load has a translational motion and consists of 600 kg weight to be lifted at a uniform speed of 2.0 m/s. coupling between this load and the motor has an efficiency of 88%. Motor has inertia of 0.4 kg-m^2 and runs at a continuous speed of 1500 rpm. Determine the equivalent inertia referred to the motor shaft and the power developed by the motor.

11. (a) Compare CSI and VSI fed shcemes applied for speed control of induction motors.

    (b) Speed of DC series motor coupled to a fan load is controlled by a variation of armature voltage. When the armature voltage is 400 V, motor takes 10 A and the fan speed is 250 rpm. the combined resistance of the armature and field is 1 Ω. Calculate

(i) Motor armature voltage for the fan speed of 350 rpm.

(ii) Motor speed for the armature voltage of 250 V.

12. Explain static Scherbius scheme for speed control of a slip ring induction motor. Draw a neat circuit diagram of the complete sheeme. Mention its advantages compared to rotor resistance control method.

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