[06 - 4121]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

ELECTRICAL DRIVES AND TRACTION

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Answer Question No. 1 and any FOUR

from the remaining.

All questions carry equal marks.

1. (a) Define steady state and transient stability of an electric drive.

   (b) Draw the modified speed - torque characteristics of a D. C shund motor and 3 - phase induction motor.

   (c) (i) What is the advantages of auto transformer starter over that of star/Delta starter?

   (ii) What is the disadvantage of 3-print starter over that of 4-point starter?

(d) Draw the circuit diagram of Regenerative braking of D.C. series motor.

(e) Define heating and cooling time constants of an electric machine.

(f) Explain series - parallel control of traction motor.

(g) Define in following:

(i) Tractive effort

(ii) Coefficient of adhesion

(iii) Adhesive weight

2. (a) Discuss briefly the stability of possible combination of joint speed torque characteristics of a motor and load.

(b) A 250 volts D.C. shunt motor has an armature resistance of 0.5 ohm and a field resistance of 250 ohms. When driving at 600 rpm a load, the torque of which is constant, the armature takes 20 Amps, if it is required

to raise the speed from 600 rpm to 800 rpm, what resistance must be inserted in the field circuit, assuming the magnetising characteristic to be a straight live

3. (a) Discuss briefly the various methods of starting of 3-phase synchronous motor.

(b) A 15 H.P, 3 - phase, 6-pole, 50 Hz, 400 volts induction motor runs at 950 rpm on full load. If it takes 80 amps on direct-on-line starting, find the ratio of starting torque to full load torque in the following cases, taking efficiency as 95.6% and p.f. 0.834 lagging

(i) When started by D.O.L and

(ii) When started by auto-transformer starter with 60% tapping?

4. (a) Explain the circuit diagrams, dynamic braking and plugging braking as applied to 3-phae shiping induction motor. Draw the torque-speed characteristics.

(b) A 50 H.P., 440 volts, D.C. shund motor is braked by plugging. calculate the value of resistance to be placed in series with armature circuit to limit the braking current to 150 amps. Calculate the braking torque so obtained and also torque when speed of motor has fallen by 40% $R_a = 0.1$ ohm; full load armature current = 100 amps. full load speed = 600 rpm.

5. (a) Explain the various criteria to estimate the rating for the motor needed to drive a cyclically varying load.

(b) Determine $\frac{1}{2}$ hour rating of a 25 kw motor having a time constant of 1.5 hours. Assume that the motor cools down completely between each load period and that the iron losses are 90% of copper loses at full load.

6. (a) Explain in detail the special features for the following drives and discuss how suitable drive motor in selected for them

(i) Paper mill drive and'

(ii) Coal mining drive

(b) A motor in fitted with a flywheel supplying a load torque of 1050 Nw-m for 20 seconds followed by a no load period sufficiently long enough for the flywheel to regain its original speed. The motor torque in required to be limited to 600 NW-m. Determine the moment of inertia of the flywheel. The no load speed of the motor is 550 RPM and it has a ship of 10% m full load.

7. (a) Explain the following terms:

(i) Adhesive Weight

(ii) Coefficient of adhesion'

(iii) Tractive effor

(iv) Schedule speed

(v) Coasting.

(b) A train has a schedule speed of 30 kmph over a level tract, distance between stations being 1 Km, station stopping time in 20 seconds; assuming braking retardation of 3 Km phps ad maximum speed 25% greater than average speed, calculate the acceleration to run the service.

8. Write short notes on the following:

(a) Ward Leonard method of speed control

(b) Overhead equipment in electric traction

(c) Methods of reducing energy losses during starting.
