

Roll No.

M-Tech

Mehd. Naim

FIRST SEMESTER EXAMINATION, 2008-2009
FUNDAMENTAL OF ELECTRIC DRIVE

Time: 3hrs.

Max. Marks: 100

Note: Attempt any Five questions. All questions carry equal marks. Be precise in your answer.

- Q1 (a) Classify and discuss various operating modes of Electric Drives and its control aspects.
- (b) Discuss the general speed torque characteristics of electric motors on the basis of applied loads.

A dc shunt motor is connected to constant voltage mains and drives a load torque, which is independent of speed. Prove that if induced emf (E) $> V/2$ (supply voltage), increasing the air gap flux per pole decreases the speed of motor, while if $E < V/2$, increasing the flux/pole increases the speed.

- Q2. Discuss the plugging and regenerative braking scheme for electric motors.

A 500 V, 40 kW, 625 rpm, dc shunt motor has full load efficiency of 90%. The field resistance is 0.2 ohm. The field current is maintained constant. Armature reaction and brush drop may be neglected. Calculate the rated armature current and hence find the speed under each of following conditions at which machine develops an electromagnetic torque equal to the rated value.

- (a) Regenerative braking: no external resistance
(b) Plugging: external resistance of 5.6 ohm inserted
(c) Dynamic braking: external resistance of 2.5 ohm inserted

Q3. Discuss the dynamics of motor-load combination for drive. Consisting a motor, single gear train as in Fig. is torque a resist load dry friction load, viscous friction load and a fan load, draw the diagram of combined system and derive equation of motion for drive system.

Q4. (a) Explain the various factor depends on size and rating of motor be used as a drive element. Discuss heating and cooling time curves, loading conditions and classes of duty.

(i) A motor has a thermal heating time constant of 45 minutes. When the motor runs continuously on full load, its final temperature rise is 80°C .

- (i) What would be the temperature rise after 1 hr if motor run continuously on full load?
- (ii) If the temperature rise on 1 hr rating is 80°C find the maximum steady state temperature at this rating.
- (iii) How long will the motor take for its temperature to rise from 50°C to 80°C , if it is working at its one-hour rating?

Q5. (a) A motor driving mining equipment delivers a load having the following load cycles:

- (i) 40kW for 10 min
- (ii) No load for 5 min
- (iv) 20 kW for 10 min
- (v) No load for 5 min

Find the suitable size of continuous y rated motor for the purpose

(b) A 8 pole, 50 Hz, three phase induction motor has a flywheel of 1500 kg-m^2 moment of inertia. Load torque is 200 kg-m for 10 sec. No load period is long enough for the fly-wheel to regain its full speed. Motor has a slip of 4% at a torque of 100 kg-m . Calculate;

- (i) the maximum torque developed by the motor, and
- (ii) the speed at the end of the deceleration period.

Assume that the speed torque curve of the motor is linear in the operating range.