Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: ELECTRIC DRIVES [ELE 3282]

(OPEN ELECTIVE – I)

REVISED CREDIT SYSTEM

Time: 3 Hours 17 MAY 2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. With a neat block diagram, briefly explain the various parts of an electrical drive. ***(05)***

1B. With a neat sketch, explain the various components of the fundamental torque equation for an electrical drive. ***(05)***

2A. A motor drives two loads: Load with rotational motion is coupled through a reduction gear of ratio 0.1, 90 % efficiency, 10 Kgm^2 MOI and 10 Nm torque. Load with translational motion is a 1000 Kg weight to be lifted at an uniform speed of 1.5 m/s and coupling between this load & motor has 85 % efficiency. The motor has an 0.2 Kgm^2 inertia and operates at 1420 rpm. Determine the equivalent inertia, load torque as referred to the motor shaft and power developed by the motor ***(05)***

2B. A drive has the following equations: motor toque, $T_M = (1 + 2\ \omega_m)$ and load torque, $T_L = 3\sqrt{\omega_m}$. Obtain the equilibrium points and determine their steady state stability ***(05)***

3A. A motor operates on a periodic duty cycle consisting of a loaded period of 20 minutes and a no-load period of 10 minutes. The max temperature rise is 60 ^0C with the heating & cooling time constants being 50 minutes and 70 minutes respectively. When operating continuously on no-load, the temperature rise is 10 ^0C. Determine (a) minimum temperature during the duty cycle (b) temperature when motor is loaded continuously ***(05)***

3B. An electric motor is subjected to a load-torque variation as below: 100 Nm for 10 min, 200 Nm for 20 min, 300 Nm for 30 min and 400 Nm for 40 min. If the motor speed is 700 rpm, determine equivalent torque & motor power rating. ***(05)***

4A. A 200 V DC shunt motor draws 50 A when operating at 600 rpm. It has an 0.1 Ω armature resistance and 200 shunt field resistance. Determine the back emf, armature current and operating speed if the flux is weakened by 20 % and torque remains constant. ***(05)***

4B. With a simple circuit connection, explain the regenerative method of DC Shunt motor braking. ***(05)***

5A. A 3ϕ, 50 Hz, 400 V, 6 pole, star connected induction motor has $R_1 = R'_2 = 1\ \Omega$ and $X_1 = X'_2 = 1\ \Omega$. For regenerative braking, determine slip at maximum torque, max torque and operating speed range for max torque. ***(05)***

5B. Briefly explain the regenerative method of 3ϕ induction motor braking. ***(05)***