Reg. No.									

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH MAKE UP EXAMINATIONS, JULY 2016
SUBJECT: ELECTRIC DRIVES [ELE 3282]
(OPEN ELECTIVE – I)

REVISED CREDIT SYSTEM

Time: 3 Hours **09 JULY 2016** MAX. MARKS: 50

Instructions to Candidates:

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

1A. List out any 5 important factors when making a choice of electrical drives. ***(05)***

1B. With a neat sketch, explain the speed-torque coordinates as applied to multi-quadrant operation of electrical drives. ***(05)***

2A. A motor drives four loads with the following data. The MOI of the motor is 1.2 Kgm^2 and operates at 1000 rpm. Determine the equivalent inertia, load torque as referred to the motor shaft and power developed by the motor.

Load	Motion	Speed	Inertia / Mass	Torque / Force
1	Rotational	200 rpm	7 Kgm^2	10 Nm
2		200 rpm	5 Kgm^2	6 Nm
3	Translational	10 m/s	10 Kg	20 N
4		10 m/s	20 Kg	30 N

(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 has a thermal heating constant of 45 minutes. When the motor operates continuously on full-load, it steady final temperature rise is 80 ^{0}C. (a) what would be the temperature rise after 1 hour, if the motor operates continuously on full-load (b) If the temperature rise on 1 hour rating is 80 ^{0}C, determine the max steady state temperature rise at this rating (c) how long will the motor take for its temperature rise from 50 ^{0}C to 80 ^{0}C if it is working at its 1 hour rating. ***(05)***

3B. An electric motor has the following duty cycle (a) Load rising uniformly from 0 to 3 kW in 20 min during the acceleration period (b) 2 kW for 50 min during normal operating condition (c) deceleration period of 10 min, when regenerative braking takes place and power is returned to the supply falling from an initial value of 6 kW to 0 (d) the interval for decking the next load cycle is 20 min. Draw the load cycle sketch and determine the motor power rating. ***(05)***

4A. A 200 V DC shunt motor with an armature resistance of 0.5 Ω, draws an armature current of 20 A. To reduce the speed by 50 %, determine the new back emf and additional resistance to be added to the armature circuit if Torque $\propto$ Speed ^{2}. ***(05)***

4B. A 220 V DC shunt motor has 0.06 Ω armature resistance, 200 V back emf at 900 rpm. The motor is driving an overhauling load of 175 Nm. Determine the minimum speed at which the motor can hold the load by means of regenerative braking. ***(05)***

5A. List out the various power stages of a 3ϕ induction motor. ***(05)***

5B. With a neat sketch, briefly explain the current-limit control method of closed-loop control of electric drives. ***(05)***