Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH (POWER ELECTRONICS & DRIVES)
END SEMESTER EXAMINATIONS, APRIL / MAY 2019
SUBJECT: POWER SEMICONDUCTOR CONTROLLED DRIVES [ELE 5221]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 24, April 2019** **Max. Marks: 50**

Instructions to Candidates:

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

1A. Determine the Stability of the equilibrium points as shown in Figure Q,No 1A

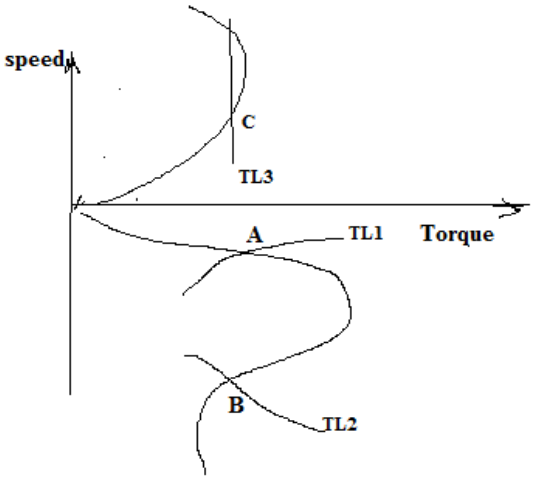

Fig.Q.No 1A

(03)

1B. Derive the total moment of inertia and Torque of motor load system with loads with rotational and linear motions ***(04)***

1C. A motor driving a load through a gear ratio 0.7 and transformation efficiency 94%. The motor and load inertia are 5kg-m^2 and 0.3 kg.m^2 respectively. The load torque is 25 N-m. Calculate the motor speed and equivalent inertia when motor develops 450W Power. ***(03)***

2A. With relevant waveforms and triggering sequence, explain singal phase fully controlled rectifier feeding a separately excited DC motor operating in controlled freewheeling motoring mode with dis-continuous conduction, when $\alpha = 60$. Derive also the expression for the average voltage developed across the armature (Consider $\beta > \prod$). ***(05)***

2B. For the ideal type A chopper circuit has fallowing conditions are given DC voltage 220V, chopping frequency 500Hz, duty ratio 0.3 and armature resistance 1Ω armature inductance La= 3mH, and back EMF= 23V. Calculate the following quantities (i) Average output current (ii) Maximum and minimum value of steady state output current. ***(05)***

3A. A 220V, 1500rpm, 11.6A separately excited DC motor is controlled by a single phase fully controlled rectifier with an AC source voltage source of 230V,50Hz enough filter inductance is 28.36mH, and armature resistance is =2Ω calculate the motor torques for the fallowing firing angle is 130° and speed is -1600rpm. ***(05)***

3B. With relevant waveforms and triggering sequence, explain three phase fully controlled rectifier feeding a separately excited DC motor armature operating in forward mode with dis-continuous conduction. Derive also the expression for the average voltage developed across the armature and speed. ***(05)***

4A. Explain the concept of slip power recovery scheme of speed control of induction motor with the help of power flow diagram. Discuss how this scheme is implemented in static sub synchronous converter cascade. What modification is needed to achieve super-synchronous mode of operation. ***(05)***

4B. Explain the concept of field oriented control. With the help of block diagram explain direct vector control scheme for variable speed Induction Motors. And mention its advantages . ***(05)***

5A. With the help of torque speed characteristics show that stator voltage control is best suited for fan and pump drive systems. Sketch the power circuit for a reversible adjustable speed induction motor drive employing stator voltage control. ***(03)***

5B. Explain the bsic concept of constant air gap flux operation and with the help of block schematic explin the flux weakning ,V/f and E/f methods used in induction motor drives. ***(04)***

5C. Describe the operation of stepper motor and reluctance motors drive and explain its advantages over the other drives. ***(03)***