H.T.No. | | | | | | | | | | |

Code No: EE1903 **GEC-R14**

M. Tech I Semester Regular/Suppl. Examinations, January 2017

ELECTRIC DRIVES-I

(Power Electronics & Electric Drives)

Time: 3 Hours **Max. Marks: 60**

Note: Answer any **FIVE** questions. All Questions carry equal Marks.

5 × 12 = 60M

1. a) A 100V, 8.5A, 1000rpm shunt motor has the armature and field resistances of 0.5Ω and 400Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate the motor speed if the source voltage drops to 75V. (6M)

   b) A 220V DC series motor runs at 1000rpm (Clockwise) and takes an armature current of 100A when driving a load of constant torque. Resistance of the armature and field winding are 0.05Ω each. Find the magnitude and direction of the motor speed and armature current if the motor terminal voltage is reversed and no of turns in the field winding is reduced to 80%. Assume linear magnetic circuit. (6M)

2. A 220V 960rpm 50A separately excited Dc motor has a armature resistance of 0.5Ω Is fed from a 3Φ fully controlled rectifier. Available AC source has line voltage of 440V, 50Hz. A star connected transformer is used to feed the armature so that the motor terminals voltage equal to rated voltage when converter firing angle is zero. Calculate the transformer turns ratio. Determine the value of the firing angle when a motor is running at 1200rpm and rated torque and the motor is running at 800rpm and twice the rated torque. (12M)

3. a) Explain the phase locked control of DC motor drive with a neat sketch. (8M)

   b) Differentiate between the open and closed loop control of dc motor drive. (4M)

4. a) A dc motor is driven from a chopper with a source voltage of 24V dc and at a frequency of 1 kHz. Determine the variation in duty cycle required to have a speed variation of 0 to 1 p.u. delivering a constant 2 p.u. load. The motor details are as follows:
   1 hp, 10 V. 2500 rpm, 78.5 % efficiency. R_a = 0.01Ω. L_a = 0.002 H, K_b = 0.03819 V/rad/sec. The chopper is one-quadrant and the on-state drop voltage across the device is assumed to be 1 V regardless of the current variation. (6M)

b) A 200 hp, 230V, 500rpm separately-excited dc motor is controlled by a chopper. The chopper is connected to a bridge-diode rectifier supplied from a 230V, 3Φ 6O-Hz ac main. The motor chopper details are as follows:

Ra = 0.04 Ω. L_a = 0.0015 H, K_b = 4.172V/rad/sec. f_c = 2 kHz. The motor is running at 300 rpm with 55% duty cycle in the chopper. Determine the average current from steady-state current and the electromagnetic torque produced in the motor. (6M)

5. Explain the dynamic simulation of the speed feedback, speed controller, command current generator and current controller of DC motor drive. (12M)
6. Explain the PWM current controller and hysteresis current controller of the chopper controlled drive. (12M)
7. Explain the three phase fully controlled converter in continuous and discontinuous conduction mode with neat sketches. (12M)
8. a) Explain the design of speed controller for a DC motor drive. (6M)
   b) Explain with a neat sketch load side of three phase fully controlled bridge for high inductive load (6M)

*****