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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Electrical & Electronics Engineering

(Electrical Machines, Power Control and Drives)

01EE6302 Electric Drives

Max. Mark: 60 Duration: 3 Hours

Answer any two full questions from each Part

PART A

1. A motor drives 2 loads. One has rotational motion. It is coupled to the motor through a reduction gear ratio 0.1 and efficiency of 90%. The load has a moment of inertia of 10 kgm^2 and a torque of 10 Nm. Other load has translational motion and consists of 1000 Kgwt to be lifted up at a uniform speed of 1.5 m/s. Coupling between this load and motor has an η of 85%. Motor has an inertia of 0.2 $kg\text{-}m^2$ and runs at a constant speed of 1420 rpm. Determine equivalent inertia referred to motor shaft and power developed by the motor. (9)

2. a) Obtain the dynamic behaviour of separately excited dc motor in constant flux mode, during starting. (4)

   b) A 220V 1500 rpm 50A separately excited dc motor with armature resistance of 0.5 Ω is fed from a 3ϕ full convertor .Available ac source has a line voltage of 440V, 50 Hz. A star –delta connected transformer is used to feed the armature so that the motor terminal voltage equals rated terminal voltage when converter firing angle is zero. Determine the value of firing angle when motor is running at 1200rpm and rated torque. (5)

3. Explain two quadrant operation of single phase full converter for continuous and discontinuous mode of operation and obtain the boundary between two modes. (9)

PART B

4. a) Draw and explain the implementation of closed loop **v/f** control strategy with slip compensation for induction motor drive. (6)

   b) With phasor diagram, explain the principle of vector control in three phase induction motor. (6)

5. Explain the Sub synchronous and super synchronous modes of operation of a three phase wound rotor induction motor using suitable Drive. (12)
6. With Circuit diagram and waveform explain the working of a field oriented controlled CSI fed induction motor drive for speed control application. (12)

PART C

7. Draw neat block diagram and explain V/F method of speed control of VSI fed three phase Synchronous Motor drive. (9)
8. a) Derive the dynamic machine model of a permanent magnet BLDC motor and derive the equation for electromagnetic torque developed. (5)
   b) Obtain the dynamic model of Permanent Magnet Synchronous Motor (PMSM) using flux linkage equations. (4)
9. Describe the working of a Position Controlled permanent magnet BLDC motor drive scheme and explain the working of current control loop. (9)
