GUJARAT TECHNOLOGICAL UNIVERSITY BE – SEMESTER – VI EXAMINATION – WINTER 2015

Subject Code:162003 Subject Name: Control of Electrical Drives Time:2:30pm to 5:00pm Instructions: Date:08/12/ 2015

Total Marks: 70

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain the variation of load torque for three different widely used applications. 07
 - (b) Motor drives the winch drum through a reduction gear with a gear tooth ratio of 0.1.The friction torque at winch shaft is 15 N-m and at motor shaft 10 N-m. Motor speed is 1500 rpm. Calculate the equivalent moment of inertia of the drive referred to the motor shaft and motor torque if gears have an efficiency of 90%.



- Q.2 (a) A 3-phase,100 KW,6 pole,960 rpm wound rotor induction motor drives a load whose torque varies such that a torque of 3000 N-m of 10 sec duration is followed by torque of 500 N-m of duration long enough for the motor to attain steady state speed. Calculate moment of inertia of the flywheel, if motor torque should not exceed twice the rated value. Moment of inertia of the motor is 10 Kg-m².Motor has linear speed torque curve in the region of interest.
 - (b) Derive the equivalent values of Drive parameter with rotational and 07 translational load.

OR

- (b) Explain the four quadrant operation of electrical drives with example.
- Q.3 (a) A motor load system has the following details: Quadrant I and II,T=400-0.4N 07 where N is the speed in rpm. Motor is coupled to an active load torque Tl=±200 N-m. Calculate the motor speeds for motoring and braking operation in the forward direction. When operating in quadrants III and IV, T=-400-0.4N.Calculate the equilibrium speed in quadrant III.
 - (b) Figure shows a plot of speed vs motor torques. Draw load torque curve and comment on the stability of the operating point in the region of AB and CD.

07



OR

- (a) Q.3 Explain the load equalization. Derive the analytical expression for the load 07 equalization.
 - (b) A step up chopper is fed from 220 V dc supply to deliver a load voltage of 660 03 V.If the non-conduction time of the thyristor is 100 μs compute the required pulse width.
 - C In a type A chopper, given the source voltage=100 V dc, ON-period=100 μs 04 ,OFF-period=150 μ s and load R=2 Ω ,L=5mH with back Emf E=10 V connected in series for continuous conduction. Calculate the average output voltage and output current.
- **Q.4 (a)** Derive the expression for the steady state time domain analysis of step down 07 chopper. 07
 - Derive the chopper E circuit with all four quadrant operation. **(b)**

Identity the given output voltage given for a single phase converter. Draw the Q.4 07 **(a)** waveform for the supply voltage, thyristor voltage and output current for the given converter. Also derive the performance parameter for the given single phase converter.



- Explain the chopper control of separately excited dc Motor with pulse width 07 **(b)** modulation technique.
- Draw the waveform of 3-phase uncontrolled converter with R-L load with Q.5 (a) 07 conduction table & performance parameter.
 - (b) Explain the field control and armature control method of dc motor. 07

OR

Q.5 Explain the working and constructional feature of variable reluctance motor. 07 (a) Explain the method of controlling speed of single phase induction motor. 07 **(b)**
