

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: 1722902**Date: 31-12-2012****Subject Name: Modern Electric Drives****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Notations used have usual meaning.

- Q.1** (a) Discuss the characteristics of induction motor with a view to stable operation. **07**
- (b) Explain reference frame theory for electrical machine. **07**
- Q.2** (a) Explain operation of DC motor operated with full controlled converter. **07**
- (b) A 200 V, 1500 rpm rated, 10 h. p. separately excited dc motor is supplied by a single phase controlled bridge rectifier and is connected to a load having a torque of 30 Nm at a speed of 1000 rpm. The other data for drive are $R_a = 0.20$ ohms, back emf constant $K_b = 68$ V/(Wb rad/s), $\Phi_f = 12 \times 10^{-3}$ Wb, and ac supply voltage $V_s = 150$ V at 50 Hz. Assume that friction and no-load losses are negligible and that the load is highly inductive, Compute (1) the torque developed by a motor (2) the firing angle of thyristors. **07**

OR

- (b) A separately excited DC motor has a rating of 50 h. p. and when supplied by a battery of 480 V through chopper, it has a mean armature current of 120 A. the field is also supplied by a chopper whose source is a battery of 250 V. other data for chopper based drive are $R_a = 0.2$ ohms, $R_f = 125$ ohms, $K_b = 72$ V/(Wb rad/s), $\Phi_f = 0.015 I_f$, duty cycle for armature circuit is $D_a = 0.7$ and for field circuit $D_f = 0.9$. The armature circuit has sufficient inductance to make the current continuous. Compute (1) the speed of a motor (2) torque developed by a motor. **07**
- Q.3** (a) Discuss closed loop operation of DC motor drive with chopper circuit. **07**
- (b) Describe class B chopper circuit for speed control of DC motor. **07**

OR

- Q.3** (a) Explain working of first quadrant chopper circuit for DC motor. **07**
- (b) Discuss four quadrant chopper circuit for DC motor. **07**
- Q.4** (a) Explain derating of induction motor operated with voltage source inverter circuit. **07**
- (b) Write a brief note on modeling of DC motor. **07**

OR

- Q.4** (a) Discuss basic principle of direct torque control of induction motor control **07**
- (b) Compare operation of induction motor operated through current source inverter and voltage source inverter. **07**
- Q.5** (a) Discuss the self-control operation of synchronous motor. **07**
- (b) Explain indirect vector control scheme for induction motor. **07**

OR

- Q.5** (a) Explain space vector modulation control. **07**
- (b) Explain continuous, intermittent and short duty cycle of motor operation. **07**
