

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E –II<sup>st</sup> SEMESTER–EXAMINATION – JULY- 2012****Subject code: 1722902****Date: 09/07/2012****Subject Name: Modern Electric Drive****Time: 10:30 am – 13:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) For DC motor, write output voltage equation if it is fed from a chopper, a 1-phase full converter, a semi - converter, 3 - phase full converter. ( 1 mark each). **04**
- (b) Determine the effective resistance of a slip ring induction motor controlled by a DC chopper system. The chopper resistance is  $2\ \Omega$ .  
A resistance of  $4\ \Omega$  is connected in series with the chopper.  $T_{\text{off}} = 4\ \mu\text{sec}$  and chopper frequency is 200Hz. **03**
- (c) Discuss mathematical modeling of a DC machine. **07**
- Q.2** (a) Discuss how the motor efficiency of an inverter fed induction motor varies with frequency. **07**
- (b) A single phase full wave converter controls a separately excited dc motor of rating 10HP, 1500rpm. Assuming the rated motor current of 30A and supply voltage of 250V, find the average torque developed by the motor. What would be the speed of motor? Assume continuous motor current and armature resistance of 0.5 ohm while the motor voltage is 0.18 V/rpm. Converter is operating with  $\alpha = 0^\circ$ . **07**
- OR**
- (b) The speed of a separately excited dc motor is controlled by an ideal step down chopper circuit, with square load voltage waveform, which is supplied from an ideal dc source of 220 volts. The motor armature circuit resistance is 0.5 ohm and armature circuit inductance is 20 mH. The motor drives a constant load torque requiring an average current of 20A. Assume continuous motor current and the motor back emf constant is 0.05 volts/rpm. Calculate (i) the range of speed and (ii) the range of duty cycle. **07**
- Q.3** (a) Discuss mathematical modeling of an AC machine. **07**
- (b) Why closed loop operation is desired? Explain closed loop operation of DC motor using converter control. **07**
- OR**
- Q.3** (a) Explain two quadrant DC motor drive operations in detail. **07**
- (b) Discuss steady-state analysis of chopper controlled DC motor drive. **07**
- Q.4** (a) If the speed control of induction motor is achieved by varying the stator voltage, what will be effect on 1. Motor efficiency and 2. Current drawn from the source. Also, enlist various AC voltage controller configurations that can be utilized for stator voltage control. **08**
- (b) Describe speed control of an induction motor using static rotor resistance method. **06**
- OR**
- Q.4** (a) Explain v/f control of induction motor with neat diagram. State its area of applications. **08**
- (b) Explain closed loop control scheme for controlling the speed of VSI fed induction motor. **06**
- Q.5** (a) Discuss indirect vector control technique for induction motor. **07**
- (b) Discuss direct torque control method for induction motor. **07**
- OR**
- Q.5** (a) Explain open loop inverter fed synchronous motor drive .state its application. **07**
- (b) Write technical note on :- space vector modulation control. **07**

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