

(Please write your Exam Roll No.)

# END TERM EXAMINATION

SEVENTH SEMESTER [B.TECH.] - DECEMBER 2010

Paper Code: ETEE401

Subject: Electrical Drives

Time : 3 Hours

Maximum Marks : 75

Note: Attempt five questions including Q.1 which is compulsory. Attempt one question from each unit.

- Q.1 (a) What is an electrical drive? What are its advantages?  
 (b) What is the difference between a.c. and d.c. drives?  
 (c) What is meant by dynamic braking?  
 (d) Define four-quadrant operation of an electrical drive.  
 (e) Why current source inverter-fed induction motor drive is operated at a constant rated flux?  
 (f) What are the similarities between brushless dc motor and a self-controlled synchronous motor drive?  
 (g) Explain the principle of operation of switched reluctance motor.  
 (h) Explain with diagram the circulating and non-circulating current mode of operation of dc drives.  
 (i) What are the advantages of micro-processor controller electrical drives?  
 (j) When varying speed by field flux control, flux must be varied in small steps only? Explain. (2.5x10=25)

### UNIT-I

- Q2 Explain the construction and principle of a Permanent Magnet DC motor. Why is it preferred for low speed application? (12.5)
- Q3 Describe the operation of closed-loop torque control scheme and its applications in battery powered vehicles or rail cars. (12.5)

### UNIT-II

- Q4 (a) Explain with a neat diagram the Ward-Leonard method of speed control. Also, mention its advantages and disadvantages. (5)  
 (b) A 200V, 400A, 500rpm separately excited motor has armature and field resistance of 0.02Ω and 10Ω respectively. The load torque is given by the expression  $T_L = 2000 - 2N$  N-m, where N is the speed in rpm. Speeds below the rated are obtained by armature voltage control and speeds above the rated are obtained by field control. (7.5)  
 (i) Calculate the motor terminal voltage.  
 (ii) Calculate the armature current when the speed is 450rpm.
- Q5 Describe the operation in detail of chopper control of separately excited DC motors. Also, determine the effective value of braking resistance. (12.5)

### UNIT-III

- Q6 What are the various methods employed for speed control of induction motor? Explain variable frequency control method in detail. (12.5)
- Q7 (a) What is the difference between true synchronous mode and self control mode for variable frequency control of synchronous motor? (5)  
 (b) A 400V, 50Hz, 4-pole, Y-connected wound-rotor induction motor has the following parameters:- (7.5)  
 $R_s = 0.5\Omega$ ,  $R_r = 0.4\Omega$ ,  $X_s = X_r = 1\Omega$  and stator to rotor turns ratio is 2. Motor is initially driving a load at 1400rpm. The motor is to be braked by plugging. How the external rotor resistance should be varied with speed, so that braking upto standstill occurs in a minimum time?

### UNIT-IV

- Q8 What is the function of microprocessor in electrical drive? Explain with neat diagram the microprocessor based control scheme for induction motor drive. (12.5)
- Q9 Why a synchronous motor does not have starting torque? Describe the microprocessor based control scheme for synchronous motor drive. (12.5)

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