

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER I (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 710709N**Date: 21/05/2016****Subject Name: Electric Drives****Time: 02:30 pm to 05:00 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) What is Speed regulation? Explain the concept of Closed-Loop Speed Control technique for separately excited DC motor. **07**
- (b) Classify the different types of industrial loads in terms of Torque Speed characteristics **07**
- Q.2** (a) A separately excited DC machine is fed from a 1-phase fully controlled rectifier bridge. Draw the waveforms representing the output voltage and current of the converter (inputs to machine) when the machine is operating in motoring mode. **07**
- (b) What is Dual converter? Draw and explain how the circulating current is controlled in dual converter with simultaneous control **07**
- OR**
- (b) Explain various modes of operation of 1-phase fully-controlled rectifier-fed separately excited motor for regenerative braking with the help of neat sketch indicating status of devices and parameters unambiguously. **07**
- Q.3** (a) Which harmonics are dominant in the output voltage of a six-step inverter? Discuss the effects of these harmonics on the performance of an induction machine fed from a six-step inverter. **07**
- (b) Draw the speed-torque characteristics of an induction motor when fed by current source. Compare the same with the characteristics when the motor is fed by a voltage source. Comment on what portion of the characteristics the motor should be operated. Why? **07**
- OR**
- Q.3** (a) Draw and explain continuous and any one discontinuous mode of operation of a 3-Phase fully controlled rectifier fed dc motor. **07**
- (b) Derive an expression for the critical speed ω_{mc} of a separately excited DC motor fed from a single-phase half-controlled rectifier. **07**
- Q.4** (a) Draw the block diagram that represents a closed-loop slip speed controlled scheme for controlling the speed of an induction motor fed by a voltage source. Clearly explain the function of each block used. **07**
- (b) Explain the principle of operation of a Static Scherbius drive. Also discuss the possible modes of operation with the scheme. **07**
- OR**
- Q.4** (a) What is the effect on the motor efficiency and the current drawn from the source, when speed control of an induction motor is achieved by varying the stator (terminal) voltage (with fixed frequency)? Discuss in brief the various AC voltage controller configurations that can be employed for the stator voltage control technique. **07**
- (b) Why an Induction motor fed by current source must be operated on the portion of the speed-torque characteristics that is generally considered statically unstable? **07**

Justify your answer with relevant discussion and characteristics

- Q.5** (a) Which harmonics are dominant in the output voltage of a six-step inverter? Discuss the effects of these harmonics on the performance of an induction machine fed from a six-step inverter. **07**
- (b) For a doubly fed wound rotor induction motor, discuss the sub synchronous motoring and sub-synchronous braking operation. **07**

OR

- Q.5** (a) Derive the equation of torque for a wound field salient pole synchronous motor operating from a voltage source of constant frequency. Hence, draw the torque angle characteristics for the same. **07**
- (b) Write a brief note on braking methods for synchronous motor **07**
