

**THE OPEN UNIVERSITY OF SRI LANKA**  
**FACULTY OF ENGINEERING TECHNOLOGY**  
**BACHELOR OF INDUSTRIAL STUDIES – LEVEL 06**  
**FINAL EXAMINATION – 2008**



**MEX6351 – INDUSTRIAL AUTOMATION**

**DATE** : **APRIL 08, 2009**  
**TIME** : **0930 HRS. – 1230 HRS.**  
**DURATION** : **THREE HOURS**

**PLEASE READ THE FOLLOWING INSTRUCTIONS BEFORE ANSWERING THE PAPER**

**INSTRUCTIONS:**

1. *This paper consists of eight questions. Answer any five questions only.*
2. *All questions carries equal marks.*
3. *Answers should be written on the answer books provided by the Examinations Division.*

**Question 01**

- (1.1) Briefly discuss the structure of an automated industrial plant and identify its main elements by taking a suitable example.
- (1.2) What are the potential benefits that can be acquired by employing automation technology in manufacturing industry?
- (1.3) Explain the types of industrial plants commonly found in industry and discuss the automation approaches that best suit the above industries.

**Question 02**

- (2.1) What are the most commonly used control schemes employed in industrial automation? Discuss the applicability of the above schemes in respect to process control.
- (2.2) Explain the requirements that need to be satisfied in order for a control system to operate successfully in a given situation.

- (2.3) Explain the control system hierarchy of a large scale automated plant. Indicate clearly the relationship among the various levels, response time and the complexity within its respective levels.

**Question 03**

- (3.1) *Sensors play a major role in the field of industrial automation.* Elaborate the importance of sensors in relation to industrial automation.
- (3.2) Explain at least five important characteristics that needs to be considered when selecting a sensor for a particular application. You may select an appropriate example to illustrate your answer.
- (3.3) Distinguish between an inductive and a capacitive sensor. Discuss the applicability of each in an automated system.

**Question 04**

- (4.1) What is 'Primitive Communication' in relation to industrial communication systems?
- (4.2) Briefly discuss the configuration of a typical industrial communication network in a large scale industrial automated plant.
- (4.3) Distinguish between device buses and process busses commonly found in an industrial automated plant. Discuss the applicability of each of the above busses within a industrial communication network.

**Question 05**

- (5.1) Discuss the advantages and disadvantages of using fluid power actuation in industrial automation.
- (5.2) Explain the operation of a stepper motor and state how it differs from the operation of a conventional AC or DC motor.
- (5.3) What makes AC motors preferred over DC motors in the application of drive systems?

**Question 06**

- (6.1) Distinguish the difference between a NC machine and a CNC machine as applied to programmable machines.

- (6.2) Explain the procedure in which 'Homing' is carried out on a CNC machine.
- (6.3) Describe the different methods of positioning employed in CNC machine tools.

**Question 07**

- (7.1) What makes an industrial robot differ from other programmable machines used in industry? Elaborate by taking suitable examples.
- (7.2) Define the term 'Reference Frame' with respect to robot manipulators and discuss the different types of reference frames used in robotics.
- (7.3) Discuss the different methods employed in programming industrial robots.

**Question 08**

Write a brief note on the following topics given below.

- (a) Mechanization vs. Automation.
- (b) Open vs. Closed loop control systems.
- (c) Star vs. Ring network topology.
- (d) Absolute vs. Incremental optical encoders.
- (e) Soft vs. Hard automation

*ALL RIGHTS RESERVED*