THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

BACHELOR OF INDUSTRIAL STUDIES – LEVEL 06

FINAL EXAMINATION – 2009

MEX6351 – INDUSTRIAL AUTOMATION

DATE	:	*01 APRIL 2010*
TIME	:	*1400HRS -1700HRS*
DURATION	:	*THREE HOURS*

PLEASE READ THE FOLLOWING INSTRUCTIONS BEFORE ANSWERING THE PAPER

<u>INSTRUCTIONS:</u>

1. *This paper consists of eight questions. Answer any **five questions only**.*

2. *Each question carries equal marks.*

3. *Answers should be written on the answer books provided by the Examinations Division.*

Question 01

(1.1) What makes industrial automation different from other forms of automation? You may draw examples to explain your answer.

(1.2) Briefly discuss the potential benefits that can be achieved by employing automation technology in industry.

(1.3) Discuss taking suitable examples from industry, situations in which automation is inappropriate.

Question 02

(2.1) What are the major questions that need to be addressed before implementing automation technology in a industry?

(2.2) Distinguish between soft automation and hard automation. Elaborate on situations where these technologies are best suited.

(2.3) Explain, why automation of discrete part manufacturing industries are much harder than automating continuous part manufacturing industries.

Question 03

(3.1) Describe the hierarchy of automation and its technologies in an industrial plant.

(3.2) Elaborate on the necessity for having an operation and process data base within a automated industrial plant.

(3.3) Briefly discuss the structure of an automated industrial plant and identify its main elements by taking a suitable example which is familiar to you.

Question 04

(4.1) Explain the control system hierarchy of a large scale automated industrial plant. Indicate the response time and the complexity within its respective levels.

(4.2) Discuss the role played by computers in closed-loop and open-loop control schemes used in industrial automation.

(4.3) What is a simple on-off controller? Explain situations where these types of controllers are best suited in an industrial application.

Question 05

(5.1) Explain the significant role played by sensors and transducers in industrial automation. Elaborate on your answer by taking a suitable example.

(5.2) Discuss using a suitable example the application areas in industrial automation where analogue and digital sensors are used.

(5.3) Justify, the sensor you would select in order to measure the liquid level in a mixing tank. What are the most important specifications that you would consider when selecting the sensor for the detection of liquid level? Explain their significance.

Question 06

(6.1) Define the term 'topology' in relation to local area networks (LAN). Briefly explain the main three types of topologies used in LAN's.

(6.2) Explain the communication hierarchy within a typical industrial plant employing industrial automation. Cite examples for each of the discussed levels.

(6.3) Distinguish between device busses and process busses in the context of industrial communication systems.

Question 07

(7.1) Write a definition for a industrial robot. What makes an industrial robot different from other automated machinery?

(7.2) State the areas where industrial robots can be successfully employed. How would you justify for using industrial robots for such areas?

(7.3) What are the methods available for programming an industrial robot? Elaborate on your answer by stating the applicability of each of the methods for various tasks.

Question 08

(8.1) Distinguish clearly the difference between NC and CNC machines.

(8.2) Explain the velocity loop and position loop control mechanisms used in CNC machine tools.

(8.3) With suitable examples discuss incremental positioning mode and absolute positioning mode in relation to CNC programming.

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