



The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	: Bachelor of Technology (Engineering)
Name of the Examination	: Final Examination
Course Code and Title	: MEX6270–FACTORY AUTOMATION
Academic Year	: 2013/2014
Date	: 05 th September 2014
Time	: 9.30am –12.30pm
Duration	: 3hours

General instructions

1. Read instructions carefully before answering the questions.
2. This question paper consists of 8 questions. All questions carry equal marks.
3. Answer any 5 questions only.

(Q1)

- a) Differentiate mechanization from automation. Cite suitable applications from the industry to support your answer.
- b) Production lines employ different automation systems depending on the nature of the production process. Discuss with examples the various types of automation systems employed in production lines.
- c) 'Certain manual operations are too difficult or too costly to automate'. Do you agree? Explain your answer with suitable examples.

(Q2)

- a) What is a flexible manufacturing system? Explain briefly.
- b) 'Flexible manufacturing systems lead to the improvement of machine utilization'. Do you agree with this statement? Justify your answer.
- c) Discuss the benefits that can be expected from a successful implementation of a flexible manufacturing system.

(Q3)

- a) 'Incorporation of **Proportional-Integral** controller may lead to instability of a closed loop system'. Elaborate on this statement.
- b) 'Programmable logic controllers are more closely associated with discrete manufacturing industries than other industries'. Explain your answer with suitable examples.
- c) Describe the necessity to have **supervisory control** in modern automation factory environment.

(Q4)

- a) Distinguish between **active sensors** and **passive sensors** with relevant applications in each type of sensors.
- b) **Accuracy** and **Precision** are two performance characteristics of sensors that are closely related. Discuss the application of these two performance characteristics in relation to industrial sensors.
- c) Followings are the parameters extracted from a set specifications of a laser displacement sensor:
 - Measurement range: $\pm 10\text{mm}$
 - Measurement point: 40mm
 - Resolution: $3\mu\text{m}$
 - Linearity: 1% Full Scale
 - Response time: 0.15ms
 - Linear output: 4-20mA

Explain the significance of the above parameters with particular reference to laser displacement sensors.

(Q5)

- a) What is meant by a direction control valve? Explain with the help of neat sketch the functioning of any direction control valve.
- b) What do you understand by Automated Guided Vehicle Systems (AGVS)? Briefly discuss the types of AGVS.
- c) What is an actuation system? Briefly explain types of actuation systems used in factory automation.

(Q6)

- a) 'Robot sensors are classified as *internal* and *external*'. Elaborate on the statement with suitable examples.
- b) What are the factors of industrial work situations that tend to promote the substitution of robots for human workers? Explain.
- c) Illustrate the types of robots based on physical geometrical configurations. Explain the applicability of each configuration in the industrial applications.

(Q7)

Consider an automated cell consisting of a CNC machine tool, a parts storage unit, and a robot for loading and unloading the parts between the machine and the storage unit. Following are areas, where in the errors can occur, thus manufacturing system can be affected on.

- i. Machine and process
- ii. Cutting tools
- iii. Work-holding fixture
- iv. Part storage unit
- v. Load/unload robot

State specifically the errors (deviations, malfunctions, etc.) that might occur within each of the above areas.

(Q8)

- a) What are industrial networks? Discuss the reasons for industrial networks to be more common in modern industrial environment.
- b) Briefly describe the levels of communication systems within a large scale industrial plant.
- c) Discuss the operation of and advantages offered by ASI bus employed at device level within an industrial communication system.

END