THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

BACHELOR OF TECHNOLOGY – LEVEL 06

FINAL EXAMINATION – 2011

MEX6270 – FACTORY AUTOMATION

DATE : *23 MARCH 2012*
TIME : *1400HRS -1700HRS*
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 carry equal marks.*
3. *Answers should be written on the answer books provided by the Examinations Division.*
4. *Commence to answer each question on a **fresh page***

Question 01

(1.1) Distinguish a factory from an industry. Elaborate on your answer by taking suitable examples.

(1.2) What are the factors that are favorable for the application of automation technology within a factory? List five such factors.

(1.3) Inappropriate application of automation may in fact, lead to lowering the efficiency and productivity within a factory" Explain by taking appropriate examples.

Question 02

(2.1) Draw a typical instrumentation system employed in controlling a plant or device, and discuss the role of sensors in such a system. Quote an example and explain your answer.

(2.2) Define sensitivity in relation to a sensor. In a particular sensor, a movement of 0.001mm causes and output voltage change of 0.02V. Calculate the sensitivity of the sensor.

(2.3) Typically, sensitivity to parameter changes and noises should be maximum with regard to industrial sensors. Do you agree with this statement? Justify your answer.

Question 03

(3.1) What are the control schemes most commonly employed in industrial automation? Discuss the applicability of such schemes with regard to process control.

(3.2) Explain with an aid of a neatly drawn sketch the various levels of control within a factory environment. Indicate clearly, the relationships among various levels, response times and their complexity.

(3.3) Describe and explain the flowing types of control schemes used in process control.

(a) Proportional control.

(b) Proportional plus integral control.

(c) Proportional plus integral plus derivative control.

Question 04

(4.1) Explain the significant role played by industrial communication systems in factory automation.

(4.2) Briefly describe the levels of communication systems within a large scale industrial plant.

(4.3) Discuss the operation and advantages offered by ASI bus employed at device level within an industrial communication system.

Question 05

(5.1) What is an actuation system? Briefly explain the types of actuation systems used in factory automation.

(5.2) Why are fluid actuation systems widely used in factory automation? Discuss with an appropriate example.

(5.3) Draw symbols to represent the following;

(a) Pressure relief valve.

(b) 2/2 valve which has actuation of push button and spring.

(c) 4/2 valve.

(d) Directional control valve.

Question 06

(6.1) How do anthropomorphic robots differ from other forms of robots? Give examples and applications of such type of robots in industry.

(6.2) Why are industrial robots an indispensable tool in the area of factory automation? Discuss taking suitable examples.

(6.3) Describe with an aid of a neatly drawn sketch a SCARA type robot. Explain the use of such robots in industry.

Question 07

(7.1) Explain the operation of variable reluctance, permanent magnet and hybrid type stepper motors.

(7.2) Briefly explain four types of typical specifications that would be considered in selecting a stepper motor for a particular drive application.

(7.3) Select suitable d.c or a.c motors for the following applications. Justify your selection.

(a) High controlled speeds.

(b) Low speeds.

(c) Economical, constant torques.

Question 08

(8.1) Why is Numerical Control (NC) technology an important aspect in factory automation? Discuss some of the major areas of application of NC technology in factory automation.

(8.2) Distinguish absolute programming from incremental programming in relation to CNC programming. Discuss the applicability of each of the two methods in relation to material removal processes.

(8.3) Discuss the significance of tool length offset in CNC programming.

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