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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	: 2014/2015
Date	: 21st September 2015
Time	: 9.30am –12.30pm
Duration	: 3 hours

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) "Automation is not always the right answer for a given production situation". Explain giving reasons.

b) In automatic control of systems, feedback control is often required to ensure high-performance control. Explain with special emphasis on:

   i. Practical difficulties in implementation

   ii. Cost concerns.

c) Explain the application of automation in the context of a factory and an industry.

(Q2)

a) What do you mean by '*Flexible Automation*'? Distinguish between hard automation and flexible automation.

b) Describe the benefits of introducing flexibility in manufacturing.

c) Briefly describe the production situations in which flexible manufacturing system technology can be applied.

(Q3)

a) "Programmable Logic Controllers (PLCs) are more closely associated with industrial automation applications". Explain.

b) Discuss the basis on which sensors are classified. You may take suitable examples to explain.

c) How is the operation of a stepper motor different from the operation of a conventional DC or AC motor? Explain.

(Q4)

a) Explain the difference between ***repeatability*** and ***accuracy*** in a robot manipulator.

b) Describe the important factors to be considered in deciding the use of robots in:

   i. Manufacturing operation

   ii. Hazardous operation

c) Briefly describe the common sensors used in robots? By taking a suitable industrial application, explain how you would select a particular sensor of an industrial robot.

(Q5)

a) What do you understand by Automated Guided Vehicle Systems (AGVS)? Briefly discuss the types of AGVS used in industry.

b) Explain the advantages of AGVs as compared to other established material transport systems in manufacturing and warehouse facilities.

c) Distinguish between pneumatic actuators and hydraulic actuators.

(Q6)

a) Describe the major functions of automation hierarchy in any typical factory (you should opt the manufacturing automation industry).

b) Consider a motor driven position control system, as commonly found in CNC machine drives.

   i. Briefly describe main feedback sensors in the system.

   ii. Identify the major sources of disturbance.

   iii. How is such drive different from that of an automated conveyor system?

c) Describe an industrial system that employs discrete sensors and discrete actuators.

(Q7)

Consider an automated turning operation that generates a cone-shaped product. Assume that system is automated and that a robot is used to load and unload the work unit. The work cycle consists of the following steps.

i. Load starting work piece
ii. Position cutting tool prior to turning
iii. Turn
iv. Reposition tool to a safe location at end of turning
v. Unload finished work piece.

Identify the activities and process parameters for each step of the operation.

(Q8)

a) "Reduction in cabling is considered a significant advantage of the Fieldbus". Explain giving reasons.
b) Explain the term of '*Primitive Communication*' in relation to industrial communication system.
c) How exactly does a network lead to the reduction of cabling over a point-to-point communication topology? Explain.

END