UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	AUTOMATION SYSTEM AND ROBOTIC
COURSE CODE	:	DEK 3223 / DAE 32503
PROGRAMME	:	3 DEE / 3 DET / 3 DAE
EXAMINATION DATE	:	MARCH 2012
DURATION	:	2 ½ HOURS
INSTRUCTIONS	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

Q1 (a) Define the terms of:

(i) Payload
(ii) Precision

(4 marks)

(b) Illustrate the comparison between robot wrist and human hand.

(6 marks)

(c) In industrial control system, an actuator is a hardware device that converts a controller's command signal into a change in physical parameter. Each actuator is controlled and driven by a controller.

(i) List three (3) types of actuator.

(3 marks)

(ii) Summarize the advantages and disadvantages for each type.

(7 marks)

Q2 (a) Compare the differences between SCARA and spherical robot based on the following characteristics:

(i) Axes motion.
(ii) The work envelope from swing view.
(iii) The ability to reach around obstacle.

(11 marks)

(b) The most commonly used electric drives in robotics are DC servo motor, AC servo motor and Stepper motor. List three (3) features for each electric drive mentioned.

(9 marks)

Q3 (a) Automated manufacturing systems can be classified into three (3) basic types.

(i) State the three (3) basic types of automated manufacturing systems.

(3 marks)

(ii) Briefly explain the production rates for each automation types.

(9 marks)

(b) Recommend the type of automations of the following products. You may explain the reason and illustrate the appropriate figure to support the explanation.

(i) Ball point pen
(ii) Television
(iii) Truck

(8 marks)

Q4 The concept of automated system can be applied to various levels of factory operation.

(a) Locate five (5) hierarchy level of automation.

(10 marks)

(b) Briefly, describe each of them.

(5 marks)

(c) Give example for each level of automation.

(5 marks)

Q5 (a) Illustrate the basic components of Programmable Logic Controller (PLC).

(5 marks)

(b) In the Figure Q5(b), a tank will be filled with two chemicals, mixed, and then drained. When the Start button is pressed, the program will start Pump 1. Pump 1 runs for 5 seconds, filling the tank with the first chemical, then shuts off. The program then starts Pump 2 to fills the tank with second chemical until float switch is triggered. After Pump 2 shut off, the program starts the mixer motor to mixes these two chemicals for 60 seconds. The program then opens the drain valve and starts Pump 3. Pump 3 shuts off after 8 seconds and the process stops. A manual Stop switch is also available in the system.

(i) Identify the input and output of this system.
(ii) Describe the production process flow by motion diagram.
(iii) Illustrate the PLC ladder diagram programming.

(15 marks)

Q6 (a) Define numerical control.

(5 marks)

(b) List all the component of operational numerical control systems.

(3 marks)

(c) From Q6(b), describe the function of each components.

(6 marks)

(d) Numerical control (NC) technology has been applied to a wide variety of operations. Illustrate two (2) kinds of application that used NC technology.

(6 marks)

Q7 (a) Explain each of the terminology below;

(i) Safeguards
(ii) Guards/ Barriers Guards
(iii) Personal Protective Equipment

(6 marks)

(b) Presence-Sensing Devices is a type of safeguards.

(i) Give two (2) examples of these devices.
(ii) Describe the functionality for each of them.

(10 marks)

(c) Differentiate between safety interlocks and power interlocking.

(4 marks)

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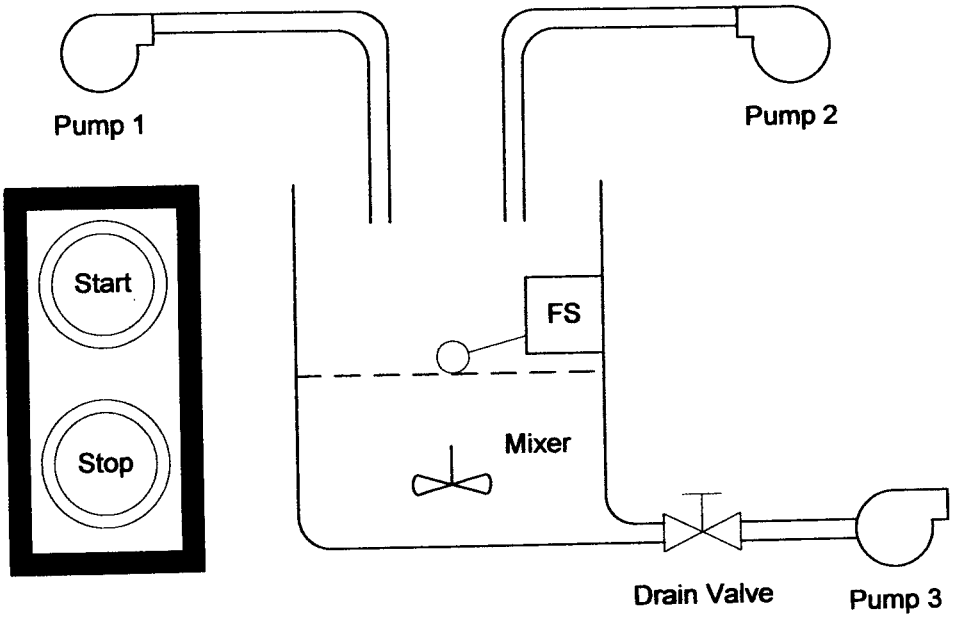

Figure Q5(b)