



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2013 SESSION

SUBJECT CODE : FAB 40604
SUBJECT TITLE : AUTOMATION SYSTEM DIAGNOSTICS AND MAINTENANCE
LEVEL : BACHELOR
TIME / DURATION :
(3 HOURS)
DATE :

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of TWO (2) sections. Section A and B. Answer ALL questions in Section A. For Section B, answer THREE (3) questions only.
 6. Answer all questions in English.
 7. A machine manual provided for all questions in Section B.
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THERE ARE 5 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

- a) Draw the structure of an automated system which consists of sensor, actuator controller, Human Machine Interface, and pre-actuator. (4 marks)
- b) List **four (4)** types of sensor used in an automated system. (2 marks)
- c) Complete **Table 1** with the standard symbol of the actuator and pre-actuator. (5 marks)

Table 1: Symbols of actuator and pre-actuator

Index	Component	Symbol
1	3/2 way single solenoid valve	
2	Contactora	
3	4 position cylinder	
4	24VDC motor	
5	Normally extended single acting cylinder	

Question 2

- a) List three (3) specifications in selecting a sensor. (3 marks)
- b) Explain the connection between a sensors and input module Programmable Logic Controller (PLC) in terms of current sinking and current sourcing of the input channels of the PLC. (4 marks)
- c) List three (3) advantages of using PLC rather than Microcontroller for an industrial automated machine. (3 marks)

Question 3

Figure 1 shows 2 levels of lift system used in a restaurant to permit the workers to send dishes from one level to another.

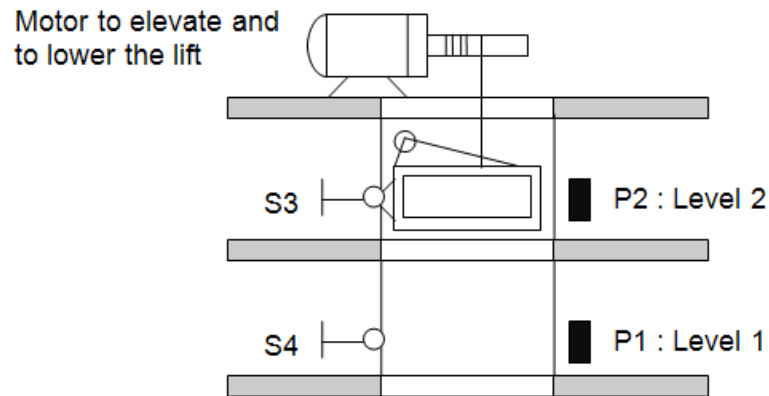


Figure 1: 2 Levels lift system

- List the inputs (sensors) and outputs (actuators) for the system in **Figure 1**.
(5 marks)
- Draw the automated system structure for the system in **Figure 1**.
(4 marks)
- Describe the periodic maintenance that needs to be done for the system.
(2 marks)
- Draw **Operational Function Chart** or **GRAFCET level 1** for the system.
(8 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer only THREE (3) questions.

Please use the answer booklet provided.

Please use the manual booklet of the Pallettic Machine provided.

Question 4

An **Operational function chart** or **Grafcet level 1** in manual booklet **page P8** is show a part of the sequence for the Pallettic machine. The functional chart represents one cycle of the whole palletizing process works.

- a) Based on the Grafcet and the inputs and outputs list, draw the **Technological Function Chart** associate with the Grafcet given.
(10 marks)
- b) Draw the transition (in ladder diagram) for the Grafcet.
(5 marks)
- c) Draw the action (in ladder diagram) for the Grafcet.
(5 marks)

Question 5

- a) Identify item labeled **RT1** in manual booklet **page P20**.
(2 marks)
- b) Explain the important of the item labeled **RT1** any Automated System.
(3 marks)
- c) Item with the symbol M3~ is a three phase motor which is actually the actuator for the elevator moving up and down. Define the type of motor connection that has been made to this motor based on the machine manual booklet **page P20**.
(2 marks)

- d) During the start-up of the machine in the morning, the operator found out that the elevator to take-up and put-down the boxes is not functioning. Using the troubleshooting techniques learned; rectify the cause of the problem by:
- i. Draw the functional block diagram of the elevator.
(5 marks)
 - ii. Do the brainstorming of the problem causes by completing the fishbone diagram given.
(5 marks)
 - iii. Suggest the most reasonable cause that makes the elevator didn't work. Justify the answer.
(3 marks)

Question 6

- a) By referring the **Grafcet at page P8** and the PLC inputs and outputs wiring diagrams at pages **P21 until P23**, draw the pneumatic circuit diagram of the system.
(8 marks)
- b) Draw the functional block diagram for the task called **Box Pusher – Pull** works. Refer manual booklet **page P21 until P23**.
(4 marks)
- c) Draw the Ishikawa/Fishbone diagram if the box pusher didn't operate.
(5 marks)
- d) Suggest the most reasonable cause that makes the box pusher didn't operate. Justify the answer.
(3 marks)

Question 7

Several modifications need to be made on the pallettic machine.

- a) First modification made is the double acting cylinder use to rotate the claw from 0' to 90' is replaced by a single acting cylinder, but the double solenoid valve is remained as it's pre-actuator.
- i. Draw the new pneumatic valve diagram for **The Claw**.
(3 marks)
 - ii. With this modification made concerning the cylinder, the Grafcet program built in **page P8** is remained the same. Justify it.
(2 marks)
- b) Second modification made: the double solenoid valve for **the claw** to open and close was changed to a single solenoid 3/2 way valve.
- i. Justify whether the cylinder need to be change.
(3 marks)
 - ii. Draw the new pneumatic valve diagram for open and close of **the claw**.
(3 marks)
- c) Briefly explain the steps on how to replace a cylinder.
(4 marks)
- d) List the preventive maintenance works of pneumatic parts in the system.
(5 marks)

End of questions