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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FAB40604**
SUBJECT TITLE	:	**AUTOMATION SYSTEM DIAGNOSTICS AND MAINTENANCE**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**9.00 AM – 12.00 PM (3 HOURS)**
DATE	:	**2 JANUARY 2015**

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 Section B.**

THERE ARE 6 PAGES OF QUESTIONS EXCLUDING THIS PAGE AND 7 APPENDIXES.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

a) The 5S elements in correct order are *Sort, Set in Order, Shine, Standardize* and *Sustain*. Elaborate the definition of ***Sort*** and ***Standardize***.

(3 marks)

b) Name **one (1)** of the DO's and DON'T's for electrical cabinet in **Figure 1**.

(3 marks)

Figure 1: Electrical cabinet at workshop

c) Identify **four (4)** maintenance checklists to be done while maintaining the pneumatic supply system of any machine.

(4 marks)

Question 2

a) List **three (3)** specifications in selecting a controller.

(3 marks)

b) Explain the connection between a sensors type (NPN or PNP) and input module of Programmable Logic Controller (PLC) in terms of current sinking and current sourcing of the input channels of the PLC.

(4 marks)

c) Draw a wiring diagram for a capacitive proximity PNP type sensor with a current sinking input module of PLC.

(3 marks)

Question 3

Figure 2 shows a liquid filling machine.

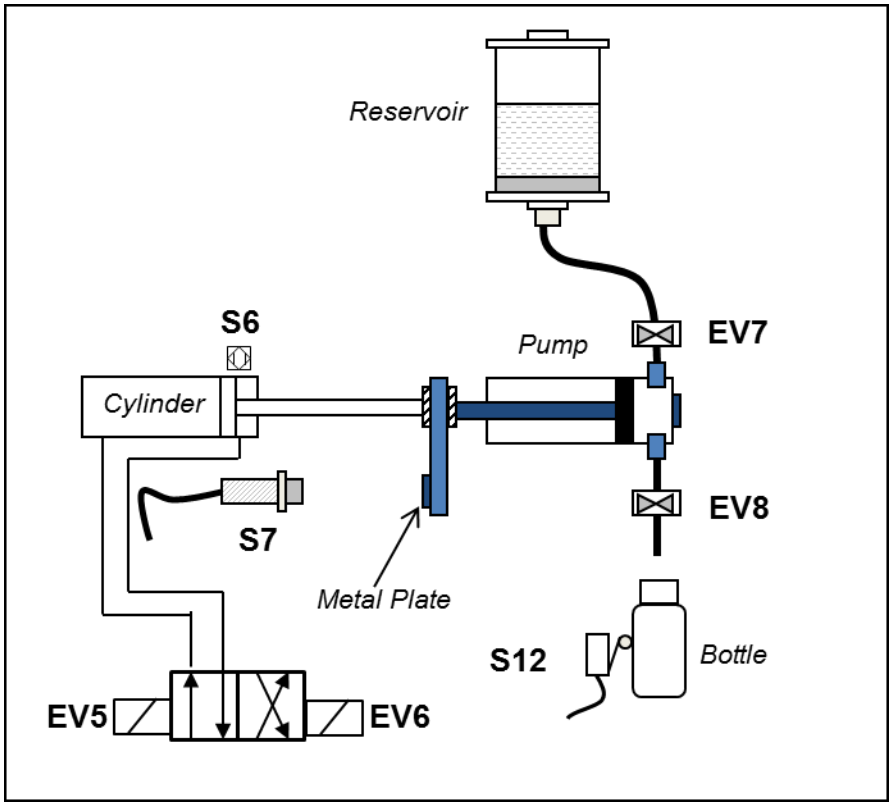

Figure 2: Filling process of a system

The system in **Figure 2** above shows an illustration of a liquid filling process in a Liquid Filling machine. The operations of the process are as follow:

- The detection of a bottle by S12 will trigger full operation to start.
- First action activate is the Inflow valve (EV7) open.
- Then, 1 sec after the liquid will be filled inside the pump by a double acting cylinder who controlled by EV6 to *pump in*
- S7 will limit the amount of the liquid pump in by the cylinder.
- Then EV7 de-energize and EV8 energize.
- 1 sec after, the liquid will be pump into the bottle by the activation of EV5 *pump out*, until S6 is ON.
- Then EV8 will de-energize. The sequence may restart only when S12 triggered new bottle.

The controller use is a PLC OMRON CJ2M-CPU31 with the dedicated address for input channel is word 0 while the dedicated address for output channel is word 1.

a) List the inputs (sensors) and outputs (actuators) for the system in **Figure 2**.

(7 marks)

b) Draw the automated system structure (control part and operational part) for the system in **Figure 2**.

(5 marks)

c) Draw **Technological Function Chart** or **GRAFCET level 2** 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 Tablet Feeding Machine provided.

Question 4

An **Operational function chart** or **GRAFCET level 1** in manual booklet **page P30** shows a part of the sequence for the Tablet Feeding machine. The functional chart represents one cycle how the capping 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) associated for each step.

(5 marks)

Question 5

a) Identify item labeled **F4** in manual booklet **page P10 (power circuit diagram)**.

(2 marks)

b) Explain the importance of item labeled **F4** in power circuit of any system.

(3 marks)

c) Determine the supply voltage for the vibrator in **P13**.

(2 marks)

d) During the start-up of the machine in the morning, the operator found out that the Feeder Motor is not functioning. Using the troubleshooting techniques learned; rectify the cause of the problem by:

i. Draw the functional block diagram of the feeder motor.

(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 feeder motor didn't work. Justify the answer.

(3 marks)

Question 6

a) By referring the manual of the machine, draw the pneumatic circuit diagram module 1 (tablet feeding) of the system.

(8 marks)

b) Draw the functional block diagram for the task called **stopper**.

(4 marks)

c) Draw the Ishikawa/Fishbone diagram if the stopper didn't operate.

(5 marks)

d) Suggest the most reasonable cause that makes the stopper didn't operate. Justify the answer.

(3 marks)

Question 7

Assuming that the PLC of the machine will be replaced by Omron PLC CJ1M-CPU23 which is a modular type of PLC (please refer Appendix1 until Appendix 14);

a) Propose the complete modules of the OMRON PLC to be used in the system.

(5 marks)

b) Redraw the PLC inputs diagram.

(5 marks)

c) Redraw the PLC outputs diagram.

(5 marks)

d) Sensor to detect the ramp saturation is broken and replaced with the new sensor, but the sensor is a NPN type sensor, redraw the connection of the sensor.

(5 marks)

END OF QUESTIONS