



**UNIVERSITI KUALA LUMPUR**  
**MALAYSIAN INSTITUTE MARINE ENGINEERING TECHNOLOGY**

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**FINAL EXAMINATION**  
**JANUARY 2016 SEMESTER**

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**COURSE CODE** : LEB 20703

**COURSE NAME** : INDUSTRIAL AUTOMATION

**PROGRAMME NAME** : BACHELOR OF INFORMATION TECHNOLOGY  
(FOR MPU: PROGRAMME LEVEL)

**DATE** : 27 MAY 2016

**TIME** : 09.00 AM – 12.00 PM

**DURATION** : 3 HOURS

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**INSTRUCTIONS TO CANDIDATES**

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**NOTE:** Instructions below to be edited to suit the needs of the intended course/examination.

1. Please **CAREFULLY** read the instructions given in the question paper.
  2. This question paper has information printed on both sides of the paper.
  3. This question paper consists of **TWO (2)** sections; Section A and Section B.
  4. Answer **ALL** questions in Section A. For Section B, answer **THREE (3)** questions **WITH AT LEAST ONE (1)** question from question 4 or question 5.
  5. Please write your answers on the OMR answer script and answer booklet provided.
  6. Answer all questions in English / Bahasa Melayu language **ONLY**.
  7. Trigonometry table has been appended for your reference.
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**THERE ARE 9 PAGES OF QUESTIONS, INCLUDING THIS PAGE.**

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## SECTION A (Total: 40 marks)

**INSTRUCTION: Answer ALL questions.**

**Please use the answer booklet provided.**

**Question 1 (CLO 1)**

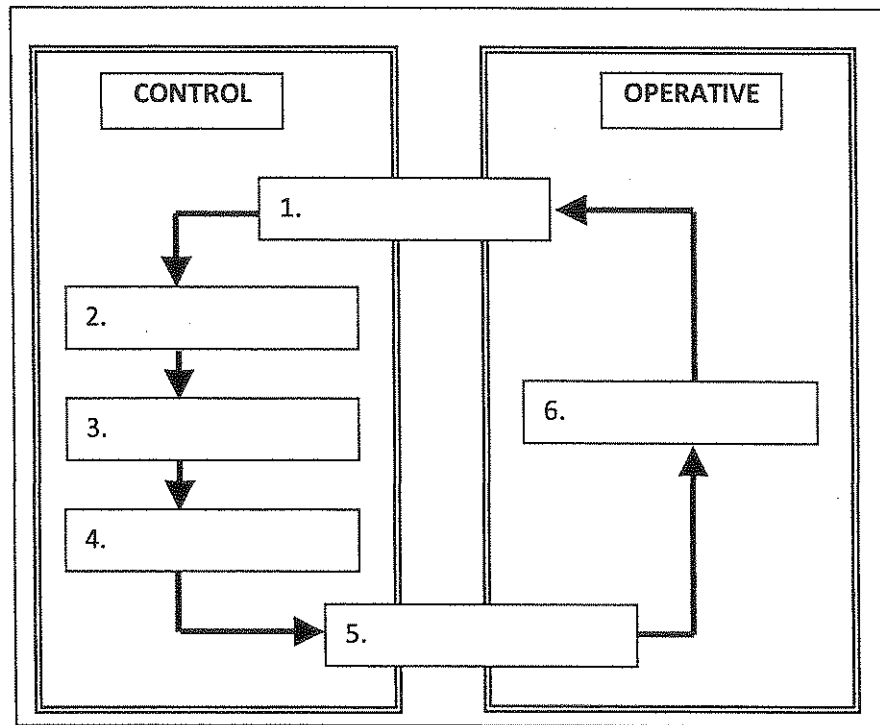
- a. Define what is **Automation**? (2 marks)
- b. "This type of sensor is only used to sense objects which made by **METAL** only"  
Define the type of sensor that explained by the explanation above and how it's function. (2 marks)
- c. Define what Mechanization is and give **one (1)** good example? (2 marks)
- d. Explain briefly how automation arise? (use block diagram to illustrate your explanation) (6 marks)
- e. Give **one** example of automated system application for each of the following environment:  
i. Industrial environment:  
ii. Domestic environment:  
iii. Commercial environment:  
iv. Public utilities: (4 marks)
- f. State **four (4)** reasons why do we choose PLC rather than Electromechanical Control? (4 marks)

Question 2 (CLO 2 and CLO 5)

a. Sensors are responsible for collecting data or signal to be analyzed by the processor. Give **two (2)** types of signals sensed by the sensor and *explain* both of them.

(4 marks)

b. Fill in the blank with the correct answer in figure 1.



(6 marks)

c. Explain the ON-OFF controller and Proportional Controller and give one good example each.

(6 marks)

d. Give **2 advantages** each of using ON-OFF controller and **2 limitations** of using Proportional Controller

(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer 3 (THREE) questions only.  
Please use the answer booklet provided.

Question 3 (CLO 3)

Figure 2 below shows an Automatic mixture system to mix two types of liquid. As an engineer of the company, your task is to convert the system from manual to fully automatic system.

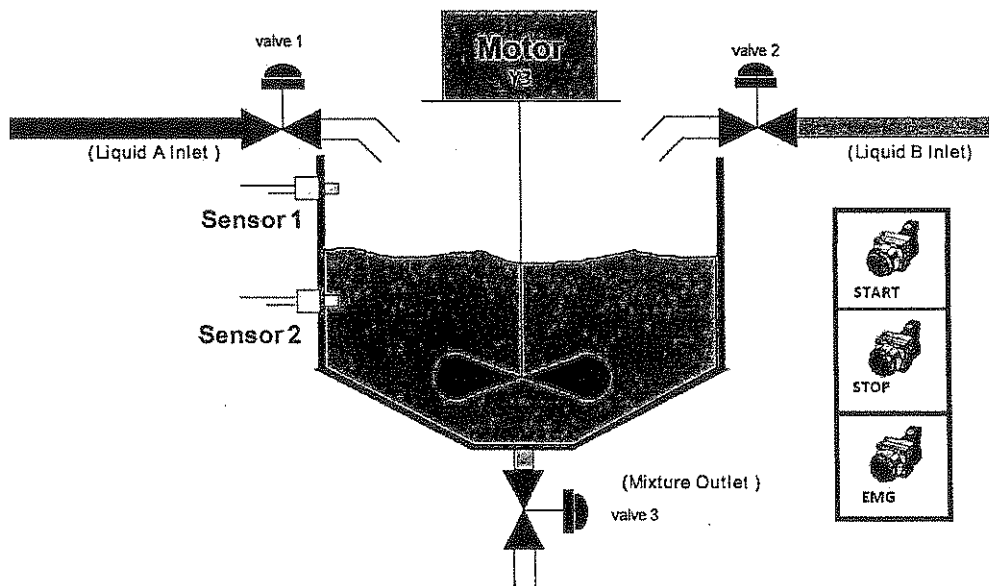


Figure 2.

- When START is pressed. Valve 1 will be ON and latched, and the valve will be opened for infusing liquid A until the level reaches the low-level float sensor.
- When the liquid reaches the low-level sensor (sensor 2). Valve 2 will be ON and latched, and the valve 2 will be opened for infusing liquid B until the level reaches the high-level sensor (sensor 1).
- When the mix liquid reaches the high-level sensor 1. Motor will be ON and activates the agitator. Also, timer T0 will start to count for 60 seconds. After 60 seconds, the motor will stop working. Valve 3 will be ON and latched, and the mixture will drain out of the container.

- When valve 3 ON, timer T1 will start to count for 120 seconds. After 120 seconds, T1 will be ON and valve 3 will be OFF. The draining process will be stopped.
- When an error occurs, press EMERGENCY STOP button and the system will then stop running.

- a. Identify the input/output devices and assigned the address to the PLC input/output table.  
(5 marks)
- b. Design a ladder diagram for the control system above.  
(15 marks)

Question 4 (CLO 3)

A mineral drinking water company is planning to construct a continuous bottle filling machine to replace manual filling system. As a new appointed engineer in the company, you are required to design a system to enhance the process of filling system and reduce time. The system is function when the bottles which are moving on the conveyor belt, to be automatically detected at the appropriate position and get it filled by the processed mineral water, after getting filled the queued bottles get chance to be filled. PLC is become requisite controller for the system brain. The system is shown in figure 3 below.

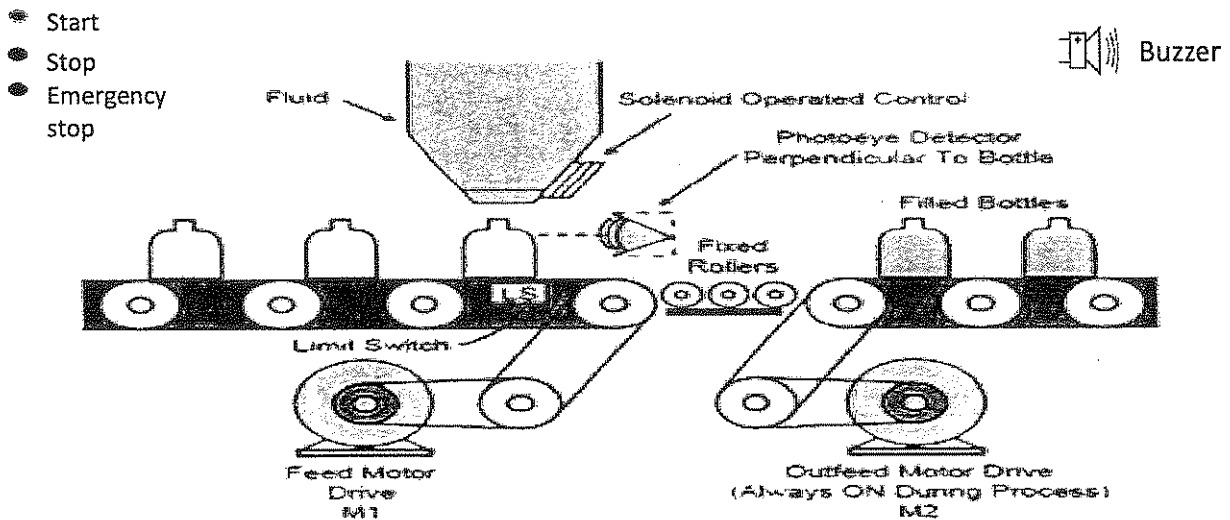


Figure 3: Automatic Bottle Filling System

The system is function when the start button has been pushed, the conveyor M1 is running until the LS (limit switch) is detect the present of the bottle, then wait for 1 sec and then fills the bottle until a photo detector detects the filled condition of the bottle. After bottle is filled, the buzzer sounds and the control program will again wait for 1s before moving to the next bottle, motor M1 runs again to feed filled bottle to conveyor M2, then the system repeats the process.

- Identify the input/output devices and assigned the address to the PLC input/output table. (5 marks)
- Draw the input/output wiring diagram based on the assigned address. (5 marks)
- Design a ladder diagram for the control system above. (10 marks)

Question 5 (CLO 3)

Majlis Perbandaran Manjung (MPM) is planning to construct a traffic light for pedestrian in front of UniKL\_MIMET. As an Engineer in MPM you have been appointed to lead the project. Below is the illustration (figure 4) and instruction of the traffic light. When a pedestrian want to cross the zebra line, he/she has to press the pushbutton.

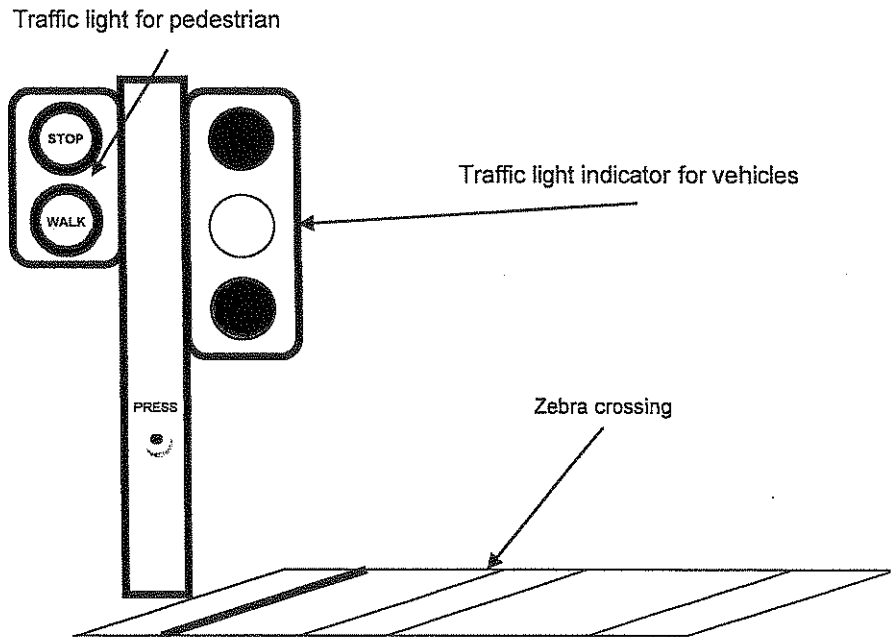


Figure 4: Pedestrian traffic light

See the sequence as below:-

User	Traffic light pedestrian	Indicator for vehicles
	STOP is initially ON	GREEN is initially ON
Press pushbutton	STOP is still ON	YELLOW is ON For 2 sec (15s after pushbutton is being pressed)
	WALK is ON for 15 sec (it should include 3s delay after RED is ON and 3s delay before RED is OFF)	RED is ON for 15 sec

Lastly, the system will turn to its initial condition.



- d. Identify the input/output devices and assigned the address to the PLC input/output table.  
(5 marks)
- e. Draw the input/output wiring diagram based on the assigned address.  
(5 marks)
- f. Design a **SFC/GRAFCET** for the control system above.  
(10 marks)

Question 6 (CLO 3)

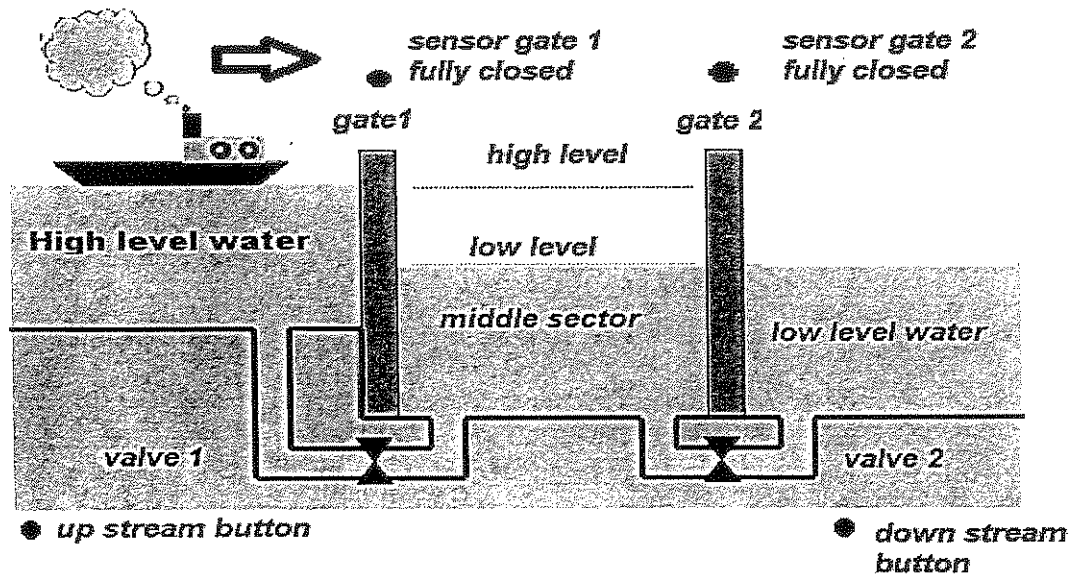


Figure 5: Water Locks System

We consider the case where a vessel is in upstream as figure 5 above.

The captain must press a button on the dock (upstream Button) to pass from upstream to middle sector

Once the captain pressed this button, the gate 2 will close (you need to consider the gate 2 is either closed or opened)

Then the valve 1 will open until the water level reaches the top level of the middle sector. Then the valve will close and the gate 1 will open.

Then the captain has 15 minutes to advance his vessel. After 15 minutes, the gate 1 is going to close and the valve 2 is open to pass the water to reach low level. After water reaching low level, the gate 2 will open and the gate 2 does not close (the gate 2 will closed if a vessel arrives from upstream, as indicated above).

a) Design Sequential Function Chart (SFC/Grafcet) level 1 for the process downstream as mentioned above.

(10 marks)

b) Now there are a vessel wants to go to upstream. Redesign your grafcet level 1.

(10 marks)

END OF EXAMINATION PAPER

PLC Omron Input/Output Wiring Diagram

