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**UNIVERSITI TUN HUSSEIN ONN
MALAYSIA**

**FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019**

COURSE NAME : INDUSTRIAL AUTOMATION
SYSTEM
COURSE CODE : BEH 31103
PROGRAMME CODE : BEJ
EXAMINATION DATE : DECEMBER 2018/ JANUARY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF EIGHT (8) PAGES

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TERBUKA

- Q1**
- (a) Explain the role of automation and control technologies in a production system. (5 marks)
- (b) With respect to the industrial automation and control technologies,
- (i) Explain **THREE (3)** basic elements for an industrial automated system. (4 marks)
- (ii) Imagine that you are the production engineer for motorcycle production. The motorcycle must meet all requirements and testing procedures. As a production engineering, point out your concerns during the planning of automation and control. (6 marks)
- (c) Small Medium Enterprise (SME) is the industry in which the production is growing and raising aggregated competition. The industry has looked for a better solution for the management of all resources including the automations.
- (i) By giving example of related SME industry, explain the concept of Computer Integrated Manufacturing (CIM) to help in finding solution. (4 marks)
- (ii) Recently, Industry 4.0 is widely discussed as the current trend of automation and data exchange in manufacturing technologies. By giving related SME industry as an example, propose the application of Industry 4.0 to the selected SME industry. (6 marks)
- Q2**
- (a) **Figure Q2(a)** shows an automatic liquid heating and stirring system. The liquid will be fed into the tank using 2 inlets (liquid A and liquid B). When the mixture reaches certain level, the mixture will then be stirred and heated. After reaching certain temperature, the mixture will be poured using liquid outlet.
- (i) Based on the automatic liquid heating and stirring system, determine appropriate sensors and actuators. (Please redraw the layout and mark the positions of the sensors and actuators.) (8 marks)
- (ii) Justify the reasons of the selected sensors and actuators proposed in Q2 (a)(i). (8 marks)

- (b) **Figure Q2(b)** illustrates a two level S-type cargo lift. You are required to propose the location of sensors and actuators of the system. Re-draw and mark the locations of the sensors and actuators including the user panel. (Name them properly.)

(9 marks)

- Q3** (a) List down **FIVE (5)** reasons why industrial robot plays an important role in manufacturing industry.

(5 marks)

- (b) A pick-and-place automation system is commonly seen in the industry to lift up heavy object. The system is available in broad choices of arrangements, depending on the application and the load. **Figure Q3(b)** illustrates a customized pneumatic system for the purpose of pick-and-place. You are requested to develop the system. The sequence request is explained as follows:

1. Upon the press of a Start push button, the system is activated. A “Start” indicator in green colour lit up.
2. The gripper is released and the vertical cylinder must be at its top position.
3. At position A, the vertical cylinder would travel downward to pick up an object. Then,
4. At position A, the gripper would close and grip the object. Then,
5. At position A, the vertical cylinder would travel upward to its top position. Then,
6. At position A, the horizontal cylinder would travel to position B. Then,
7. At position B, the vertical cylinder would travel downward to place the object. Then,
8. At position B, the gripper is released. Then,
9. At position B, the vertical cylinder would travel upward to its top position. Then,
10. At position B, the horizontal cylinder would travel to position A.
11. A cycle is completed. The “Start” indicator is off.
12. A new cycle would be triggered if the Start push button is pressed again.

- (i) Select the types of sensors and actuators to be applied according to the diagram and description. Mark the locations of your suggestion in a system layout diagram.

(4 marks)

- (ii) Construct the input/output diagram, if OMRON programmable logic controller, CQM1H is used.

(Note: Input starts from channel 0; Output starts from channel 100.)

(4 marks)

- (iii) Establish the sequences using a Grafset diagram.

(12 marks)

- Q4** (a) Industrial production involves numerous cycles of repetitive and sequential operations. From time to time, the automation sequences could be modified or altered to meet the production need in a short notice. Give **FOUR (4)** benefits of using a programmable logic controller (PLC) in the industrial automation for production.

(4 marks)

- (b) **Figure Q4(b)** shows the ladder diagram to control two lamps. Examine the condition of Lamp 1 and Lamp 2 based on the following conditions:

- (i) Condition 1: Only button A is pushed.

(2 marks)

- (ii) Condition 2: Only button B is pushed.

(2 marks)

- (iii) Condition 3: Only button C is pushed

(2 marks)

- (c) **Figure Q4(c)** shows the ladder diagram of a manufacturing process. Develop the mnemonic code for the ladder diagram.

(5 marks)

- (d) **Figure Q4(d)(i)** and **Table Q4(d)** show the game buzzer control system and the IO assignment respectively. The requirement are as follows:

- After the host had finished with the question, the 3 players will press the pushbuttons (PB1 ~ PB3) in front of them to fight to be first to answer the question.
- The buzzer will sound for 10 seconds after any one of the player has touched the pushbutton.
- The light indicator in front of each player will light up and only reset by the host's pushbutton.

Analyze the ladder diagram in **Figure Q4(d)(ii)** and fill in the box from A to E with appropriate elements and addresses.

(10 marks)

- END OF QUESTIONS -

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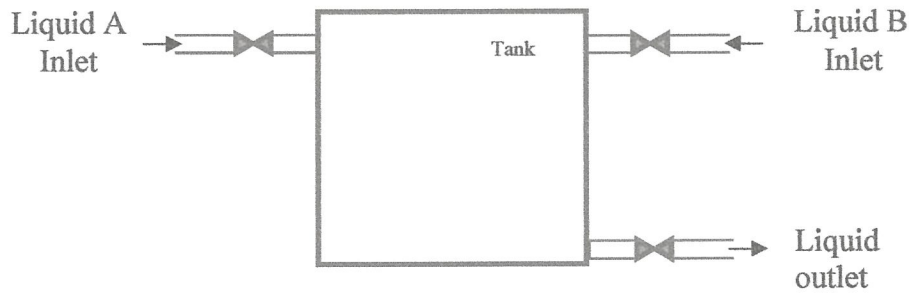


Figure Q2(a)

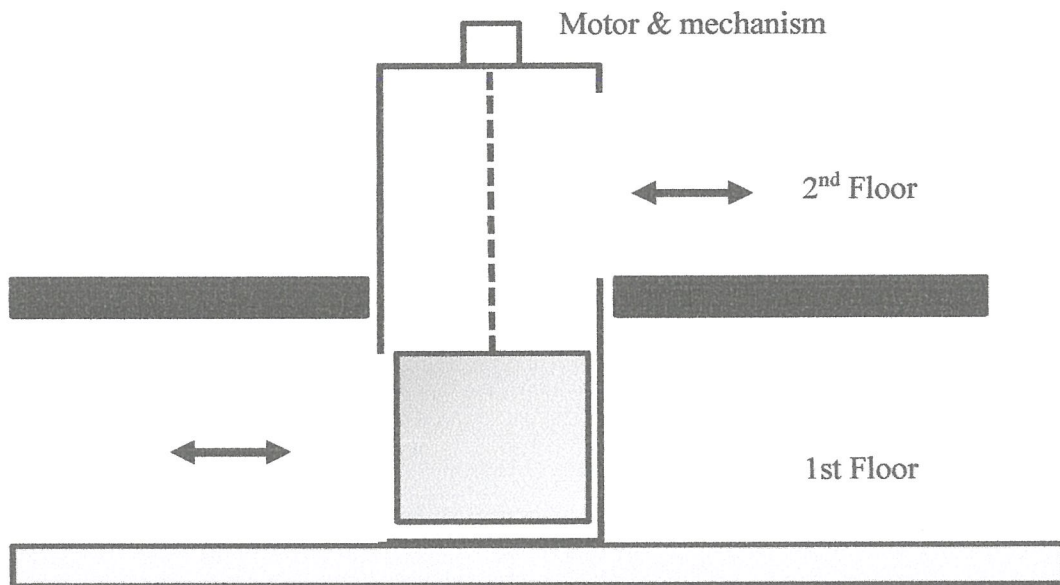


Figure Q2(b)



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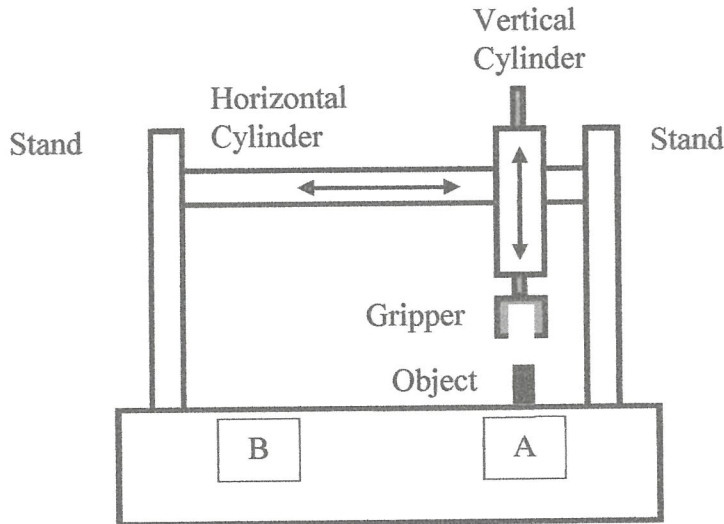


Figure Q3(b)

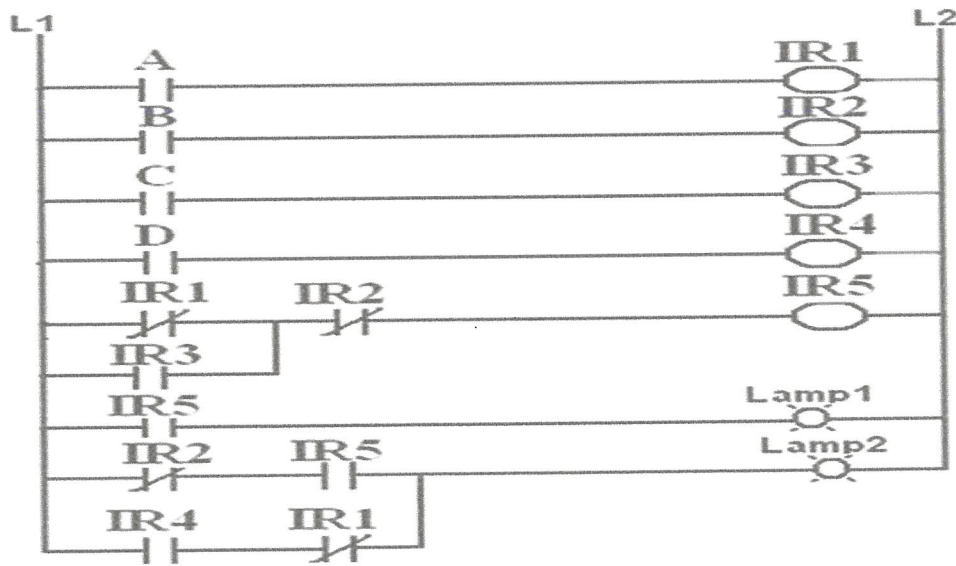


Figure Q4(b)

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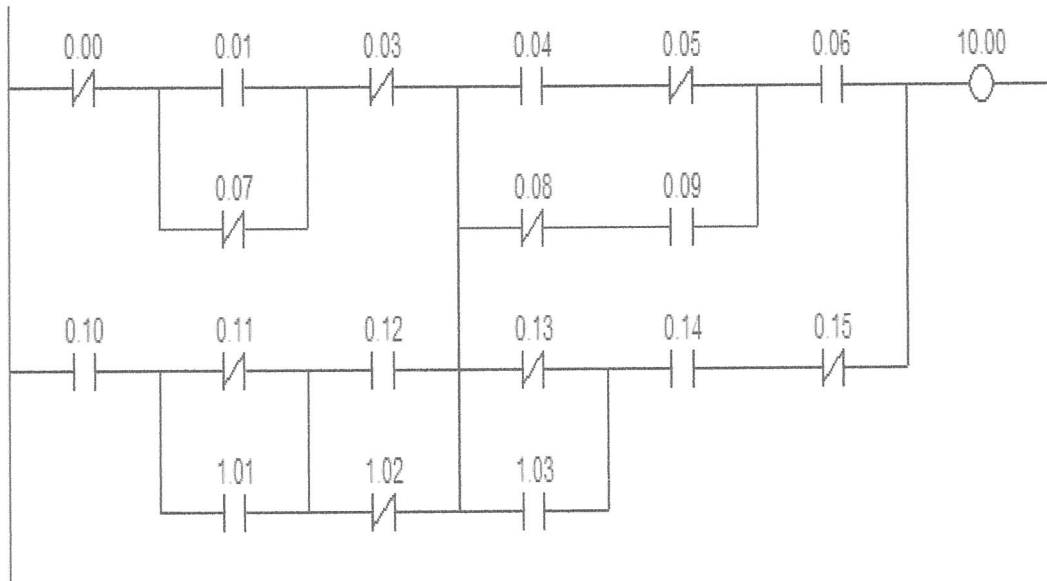


Figure Q4(c)

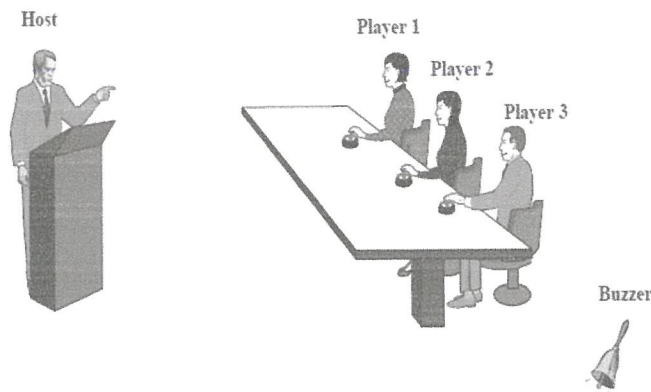


Figure Q4(d)(i)

Table Q4(d): IO Assignments

Input	Device
00000	PB1
00001	PB2
00002	PB3
00003	RST (reset)

Output	Device
01000	Buzzer
01001	Player 1 light
01002	Player 2 light
01003	Player 3 light

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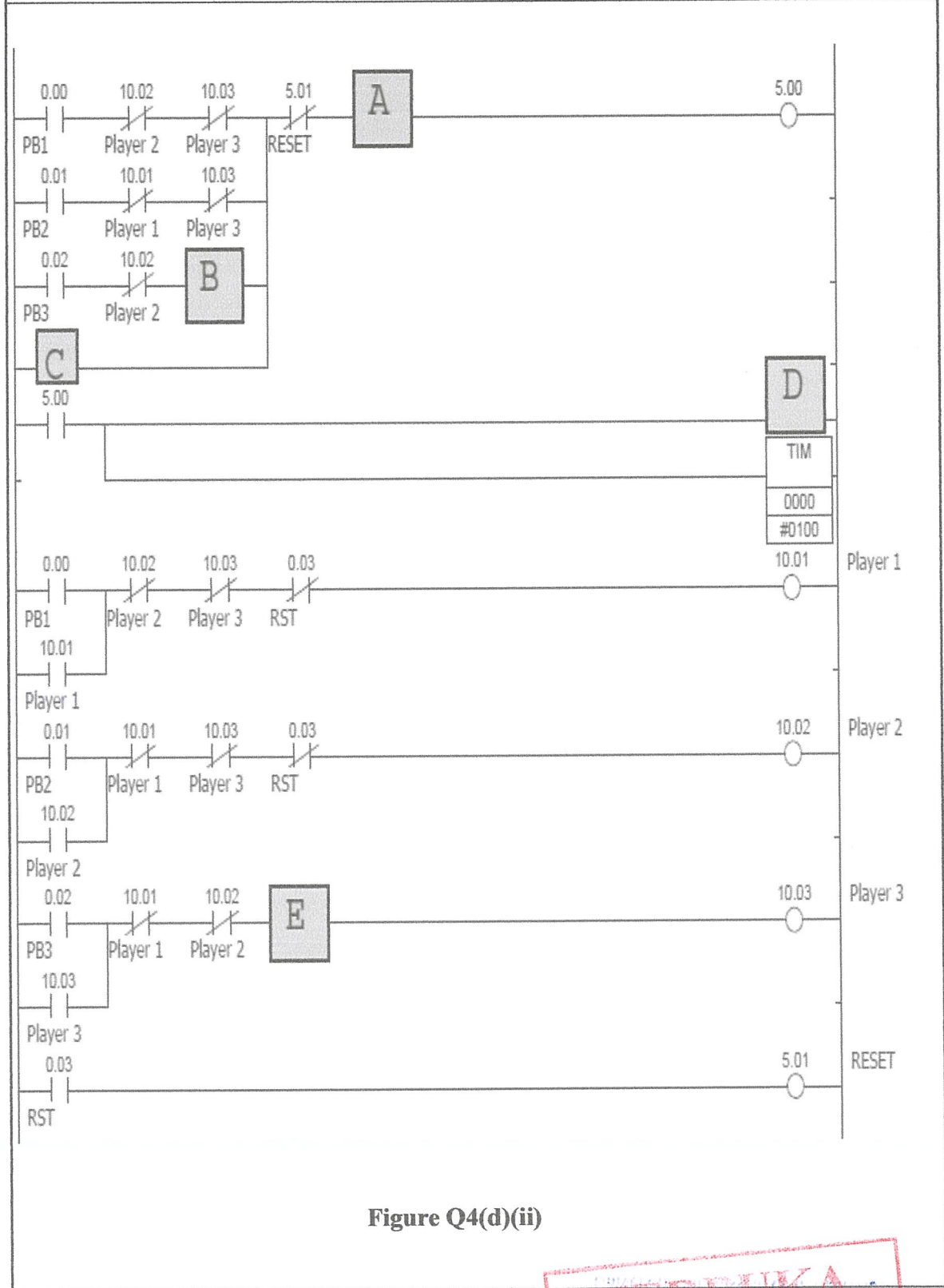


Figure Q4(d)(ii)