



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017**

COURSE NAME : AUTOMATION SYSTEM
COURSE CODE : BNJ 30803
PROGRAMME CODE : BNK
EXAMINATION DATE : JUNE 2017
DURATION : 3 HOURS
INSTRUCTION : ANSWERS **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

- Q1**
- (a) Describe the meaning of Automation System. (1 mark)
 - (b) Explain **THREE (3)** categories in terms of the human participation in the processes performed by the manufacturing system. (6 marks)
 - (c) Propose **THREE (3)** phase of how to introduce new products that use automation migration strategy. (6 marks)
 - (d) Type of Automation in industry depends on product variety and production quantity. Discuss the classification or types of industrial automation and features. (12 marks)
- Q2**
- (a) Define hydraulic system. (2 marks)
 - (b) Differentiate between hydraulic and pneumatic automation system. (6 marks)
 - (c) Draw and briefly explain a simple diagram of energy conversion and transport of hydraulic power unit in heavy duty industry. (8 marks)
 - (d) Design a basic circuit of a hydraulic system for stamping machine. List down the components used in this system. (6 marks)
 - (e) Suggest **THREE (3)** applications of hydraulic system in special technology. (3 marks)

Q3 (a) Electro-pneumatic system is usually used in commissioning PLC system. Draw and explain an example of the pneumatic circuit and electrical circuit for a process that used 3/2 way DCV single solenoid with spring return and single acting cylinder. Used relay as indirect control.

(10 marks)

(b) The automatic sealing process will used to pack rice grains. Each pack consists of 500 g of rice grains. The packing process is conducted vertically where the pre-tare rice will drop in a 10 cm diameter cylindrical hollow PET plastic, **Figure Q3 (b)**. Once the rice drops into the plastic, two heaters seal the top of the pack. Neglect the timing accuracy. The accurate packing timing can be worked out during system installation. Propose the:

- (i) Suitable actuators, input devices and valves
- (ii) Electro-pneumatic circuit
- (iii) Electrical circuit

(15 marks)

Q4 (a) Describe the meaning of Programmable Logic Control (PLC).

(2 marks)

(b) Sketch **THREE (3)** common element used in PLC in industry.

(3 marks)

(c) **Figure Q4 (c)** shows an automatic stacking program. The conveyor M1 is used to stack metal plates onto conveyor M2. The photoelectric sensor provides an input pulse to the PLC counter each time a metal drops from conveyor M1 to M2. When 15 plates have been stacked, the PLC timer activates conveyor M2 for 5 sec. Design the ladder diagram for the process.

(20 marks)

- Q5** (a) Describe the definition of Material Handling (MH) and list **THREE (3)** objective of the MH. (5 marks)
- (b) There are a lot of Material Handling equipment in industry. List **FOUR (4)** categories of Material Handling equipment to achieve real approach of MH. (4 marks)
- (c) A unit load is the single item picked up and moved between two locations. Propose **THREE (3)** method that affect the unit load design. (6 marks)
- (d) Material Transport equipment play an importance part in MH. Good transportation system is mandatory to succes in production. Discuss the transportation system components for material handling below:
- (i) conveyors
 - (ii) industrial vehicles/truck
 - (iii) cranes and hoists
 - (iv) auxiliary
- (10 marks)

Q6 (a) An industrial robot system in industry is quite similar to a human arm and used to replace the human task when there is a challenge in production. Analyse the importance component for the robot system in packaging industry.

(5 marks)

(b) **Table Q6 (b)** shows the device list used at a plant and **Figure Q6 (b)** shows a simulation automatic packaging machine. The machine is designed to move a object from P6 →P5, object from P3 →P2, object from P1 →P6 and object from P5→ P4.

Based on the sequence operation of one manufacturing cell which is control by robot:

(i) Develop the programming file of above movement. (MB4 file)

(15 marks)

(ii) Develop the programming file for object back to original position.

(5 marks)

-END OF QUESTION -

FINAL EXAMINATION

SEMESTER/ SESSION : SEM II/ 2016/2017
COURSE : AUTOMATION SYSTEM

PROGRAMME : BNK
COURSE CODE : BNJ 30803

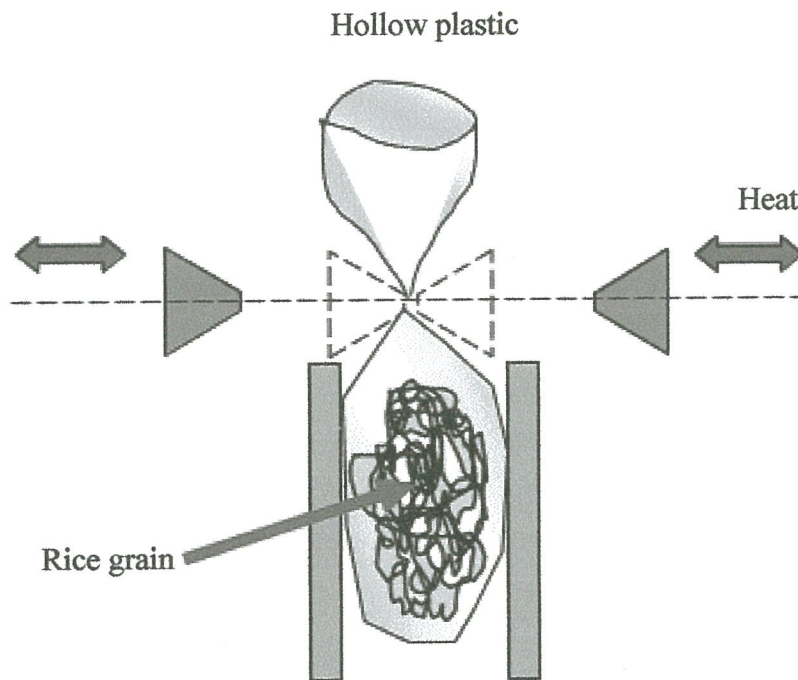


FIGURE Q3 (b)

FINAL EXAMINATION

SEMESTER/ SESSION : SEM II/ 2016/2017
COURSE : AUTOMATION SYSTEM

PROGRAMME : BNK
COURSE CODE : BNJ 30803

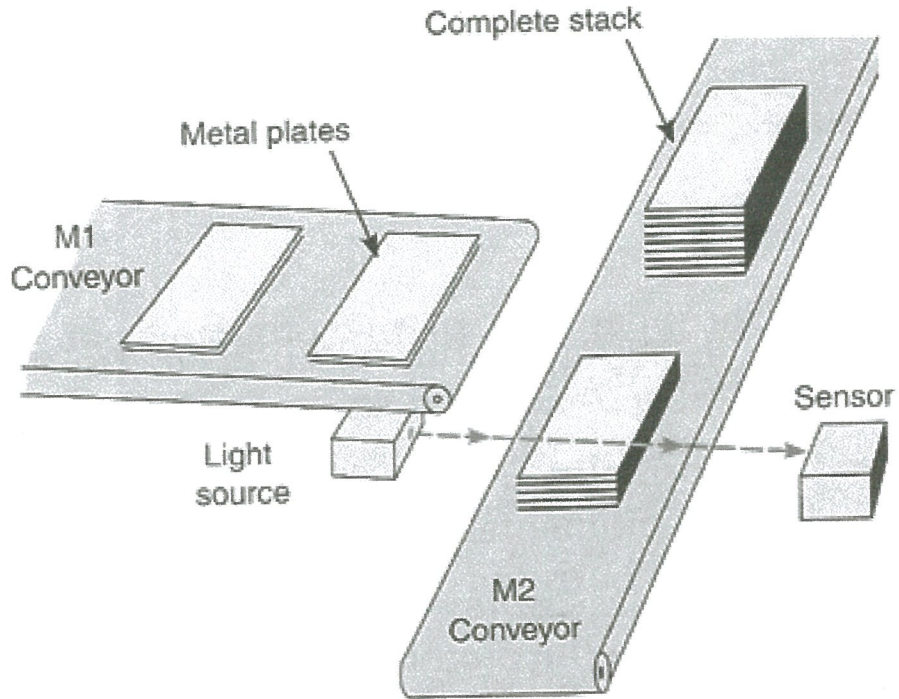


FIGURE Q4 (c)

FINAL EXAMINATION

SEMESTER/ SESSION : SEM II/ 2016/2017
COURSE : AUTOMATION SYSTEM

PROGRAMME : BNK
COURSE CODE : BNJ 30803

Table Q6 (b): Device list

Num. Item	Device	Num. of Unit
1	Robot arm	1
2	Square Packaging box	2
3	Table	3
4	Cylinder packaging box	1

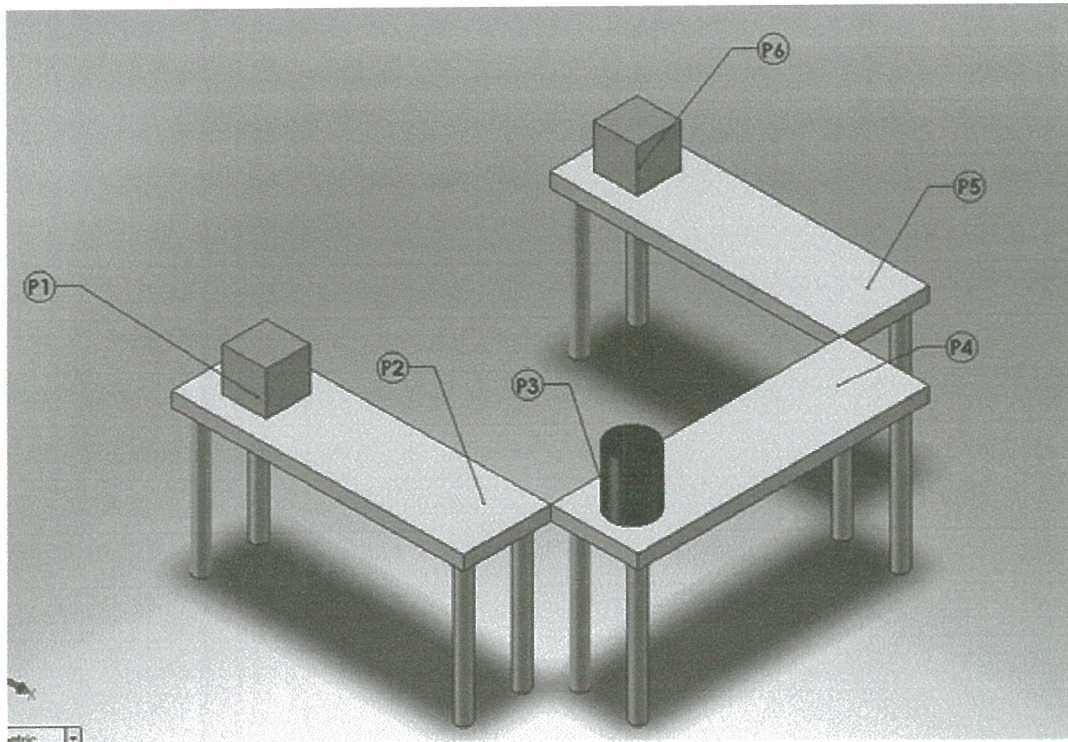


FIGURE Q6 (b)

MOHAMED ALI BIN ESA
Pengajar
Fakultas Teknologi Industri
Universiti Teknikal Malaysia