



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : **INDUSTRIAL AUTOMATION AND
ROBOTICS**

COURSE CODE : **BNM 40304**

PROGRAMME CODE : **BNM**

EXAMINATION DATE : **JUNE / JULY 2019**

DURATION : **3 HOURS**

INSTRUCTION : **ANSWER ALL QUESTIONS**

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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- Q1** (a) List **FOUR (4)** reasons of automation in manufacturing industry. (4 marks)
- (b) Describe the general sensing method and the application of the following sensors;
i. Photoelectric sensor
ii. Inductive sensor
iii. Capacitive sensor (6 marks)
- (c) Distinguish the difference between hydraulic actuator and pneumatic actuator, in term of its speed, force, operation condition, durability and applications. (10 marks)
- Q2** (a) Explain sinking output and sourcing output concept in Programmable Logic Controller (PLC) wiring system. Support your answer with appropriate diagram. (8 marks)
- (b) A hydraulic cylinder operated shear cutting machine starts to cut metal plate by pressing two push buttons together (see **Figure Q2(b)**). Once it cut the metal plate, the hydraulic cylinder returns to its initial position. A red lamp will switched on when the cutter is cutting and switched off when the cutter is at rest. The machine would not wort if the safety door is not closed properly. Write a PLC program using ladder logic diagram and PLC wiring diagram for the case study above. (12 marks)
- Q3** (a) Name **TWO (2)** types of serial communication and **TWO (2)** types of parallel communication. (4 marks)
- (b) Discuss the functions of SCADA (Supervisory Control and Data Acquisition) in manufacturing plant. (6 marks)
- (c) A leak test machine is designed to detect any leakage of the newly fabricated vehicle radiator water tank. This machine consists of two pressure sensors and one flow sensor. If there is leakage, the pressure sensors gives inconstant data and the fluid flow reading will drop down. The pressure and fluid flow data are observed and recorded by Quality Assurance (QA) department. Leakage radiator water tank will be collected for rework. All the information of good and rework radiator water tank can be accessed by factory management team. Propose a suitable Data Acquisition (DAQ) system for this leak test machine. Support your answer with appropriate system configuration. (10 marks)

- Q4** (a) Name **FOUR (4)** types of end effector for industrial robot which is utilized in manufacturing industry. (4 marks)
- (b) Gerisek Glass Sdn. Bhd. produces glass beakers for laboratory usage. In order to increase their beaker packing process efficiency, the company plan to apply industrial robots. Suggest a suitable end effector for the industrial robot that can be used to transfer four beakers from conveyor into the box as showed in **Figure Q4(b)**. Each beaker has 80mm outer diameter and 100mm height. (6 marks)
- (c) **Figure Q4(c)** depicts a motion path of an industrial robot. The task is to pick the metal cover and place it on to the housing. Write a program for the motion path using based on Melfa Basic IV robot programming language. (10 marks)
- Q5** (a) Define unit load concept. (2 marks)
- (b) Analyse the advantages and limitations of fixed and mobile transportation system in industry. (8 marks)
- (c) Summarize how Internet of Things (IoT) supports local Small and Medium Industries (SMIs) to survive in global open market environment. (10 marks)

-END OF QUESTIONS -

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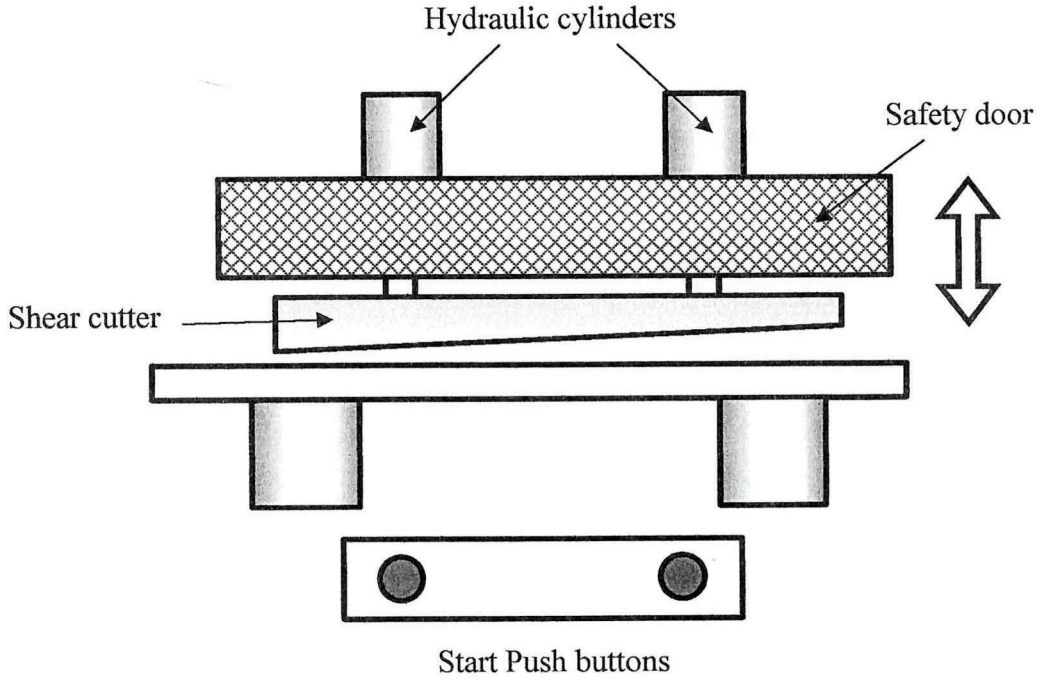


Figure Q2(b)

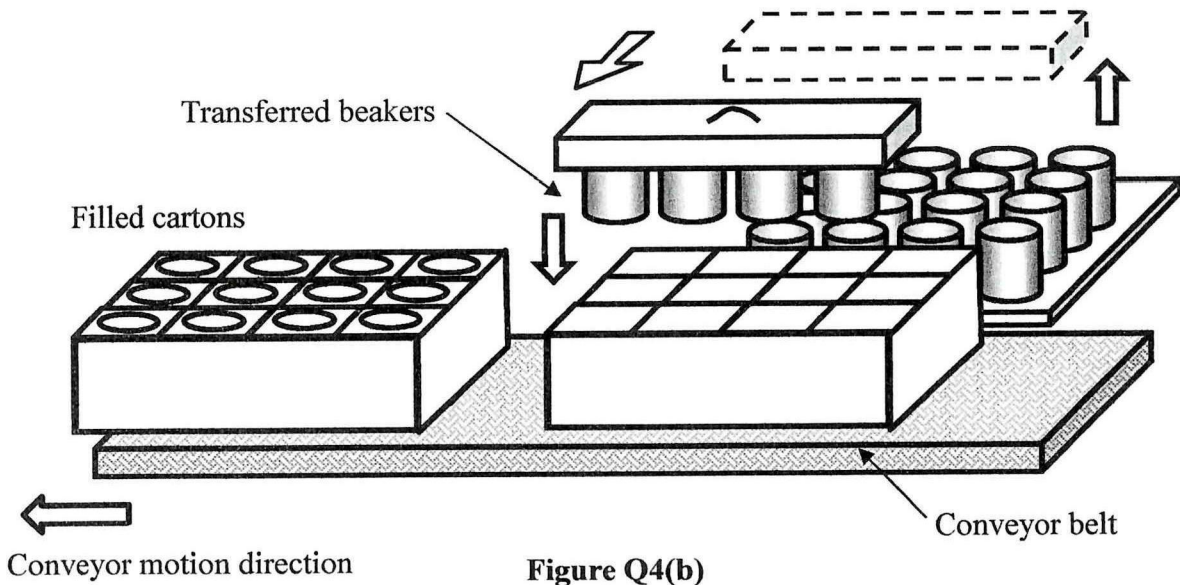


Figure Q4(b)

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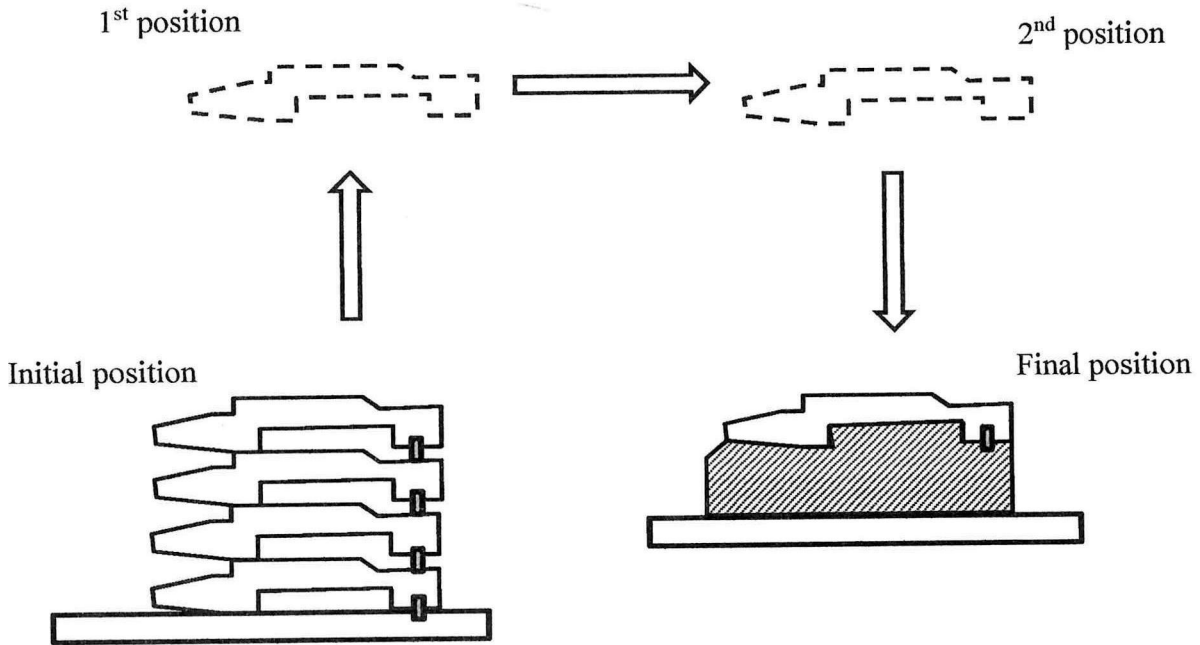


Figure Q4(c)