Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	INDUSTRIAL AUTOMATION AND ROBOTICS
COURSE CODE	:	BNM 40304
PROGRAMME CODE	:	BNM
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Describe in brief the automation levels.

(5 marks)

(b) Name the sensor that can measure or that indicates;
(i) Temperature changes
(ii) Pressure changes
(iii) Distance
(iv) Metal or non metal object using optical or light
(v) Sound

(5 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) Discuss the difference between Programmable Logic Controller (PLC) control system and PC based control system. Provide an example for PLC control system and PC based control system.

(10 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 be switched on when the cutter is cutting and switched off when the cutter is at rest. The machine would not work if the safety door is not closed properly. Draw a PLC program using ladder logic diagram and PLC wiring diagram for the case study above.

(10 marks)

Q3 (a) Name **TWO (2)** types of serial communication and **TWO (2)** types of parallel communication.

(4 marks)

(b) Discuss how SCADA (Supervisory Control and Data Acquisition) helps to improve productivity in manufacturing industries.

(6 marks)

(c) A company is developing a cushion material test machine. The construction of this machine is presented in **Figure Q3 (c)**. There are three parameters to be observed for this machine, which are the elastic characteristics measured by load cell, pneumatic air pressure for the compression cylinder and the pneumatic cylinder stroke distance, measure by laser displacement sensor. Justify a suitable Data Acquisition (DAQ) system for this cushion test machine. Support your answer with appropriate system configuration diagram.

TERBUKA (10 marks)

Q4 (a) Describe the features of these industrial robot types;

(i) SCARA robot
(ii) Vertical articulated

(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 to transfer four beakers from conveyor into the box as showed in **Figure Q4(b).** Each beaker has 80 mm outer diameter and 100 mm height. With the aid of a diagram, select the possible end effector for the robot.

(6 marks)

(c) **Figure Q4 (c)** depicts a motion path of an industrial robot tip. The task is to pick a box and place it on to the conveyor. Write a program for the motion path using based on Melfa Basic IV robot programming language.

(10 marks)

Q5 (a) Explain the unit load concept.

(2 marks)

(b) Analyse the advantages and limitations of fixed and mobile transportation system in industry.

(8 marks)

(c) Discuss how Internet of Things (IoT) supports local Small and Medium Industries (SMIs) to survive in global open market environment.

(10 marks)

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-END OF QUESTIONS -

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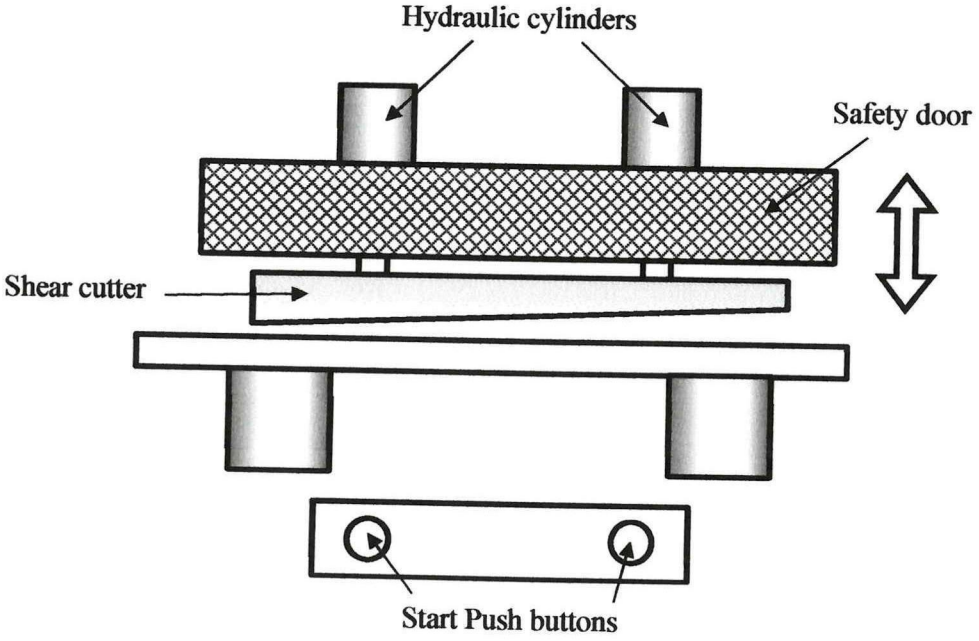

Figure Q2 (b)

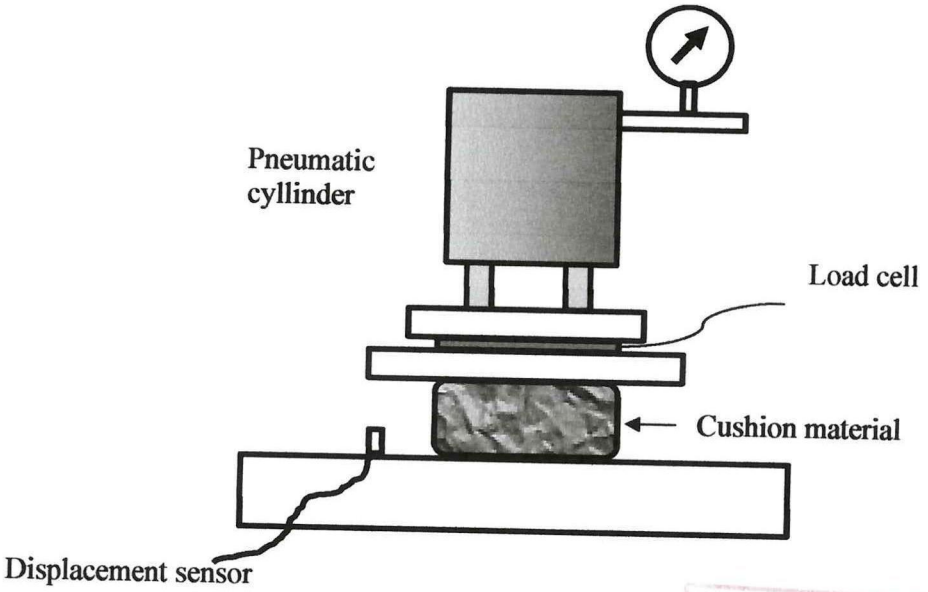

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Figure Q3 (c)

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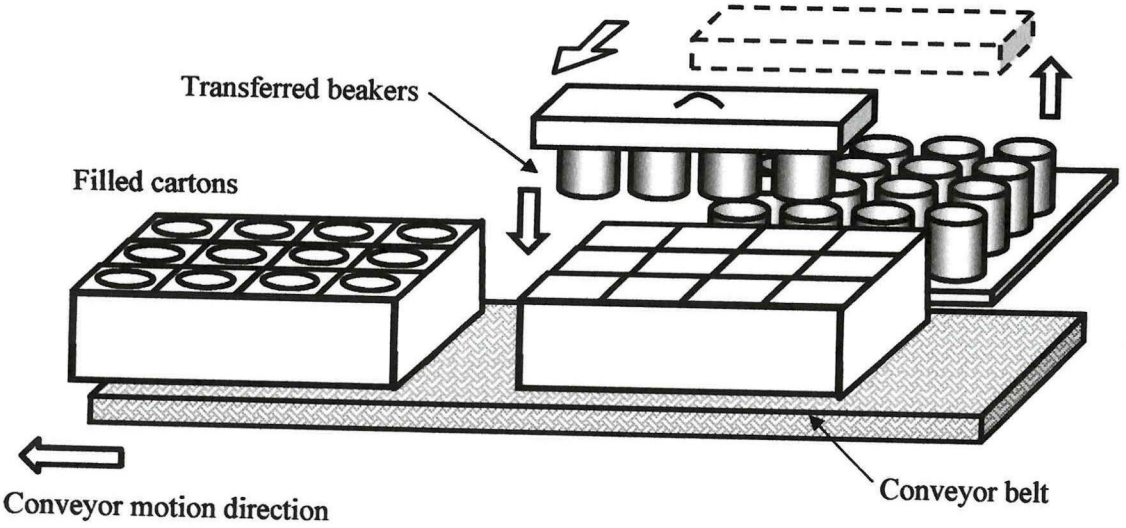

Figure Q4 (b)

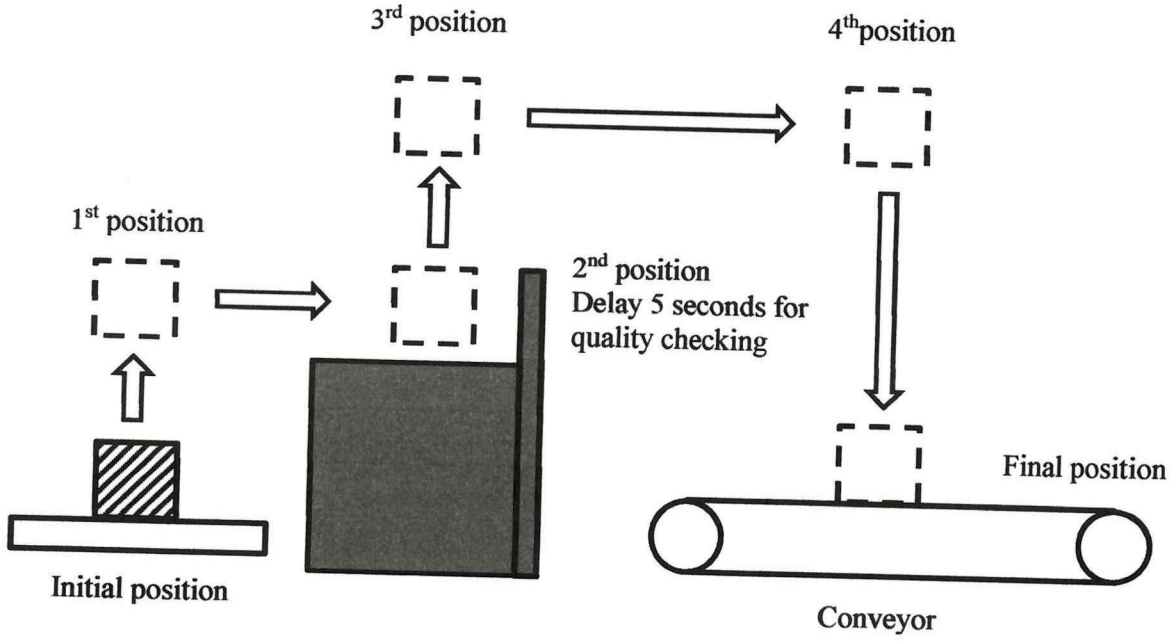

Figure Q4 (c)

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