Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	MANUFACTURING CONTROL TECHNOLOGY
COURSE CODE	:	BDD40803
PROGRAMME	:	BDD
EXAMINATION DATE	:	DECEMBER2019/JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ONLY FIVE (5)** QUESTIONS FROM **SIX (6)** QUESTIONS PROVIDED

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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Q1 (a) Reconfigurable manufacturing systems are the latest advance in the development of a manufacturing system. First step were fixed production lines with the machines dedicated to the performance of specific tasks so only one product could be produced. Next step were flexible production systems with programmable machines that allowed production of a variety of different products but offered no flexibility in the production capacity. Discuss **TWO (2)** type of common material transport equipment routing in multiple station manufacturing system with example and sketch these routing system.

(6 marks)

(b) The manufacturing system is where the value added work to accomplished on the parts and products through collection of integrated equipment and human resources, whose function is to perform one or more processing and assembly operation. Sketch the position of the manufacturing system in the larger production system in complete with the appropriate labels of correspond enterprise and factory level.

(5 marks)

(c) Evaluate **THREE (3)** three basic manufacturing systems categories in single station cell, multi station systems fixed variable routing and variable routing by discussing the criteria and example with operation, automation and typical part or product variety on each categories.

(9 marks)

Q2 (a) A feedback loop is a common and powerful tool when desiging a control system. Employ the feedback system by sketching the example of application which enables the system to adjust its performance output response and briefly explain the advantagse of this system.

(5 marks)

(b) The home heating process can be organized as control loop block diagram to maintain house temperature by using furnace burner in spite of disturbance. If $e(t) = SP\text{-}PV > 0$, the controller signals to open the valve and if $e(t) = SP - PV < 0$, it signals to close the valve. A sensor will measures the temperatures and transmits a signal to the controller. Evaluate by skething related close loop block diagram component and briefly explain the important elemnts of this heating system.

(9 marks)

(c) PID controllers use a control loop feedback mechanism to control process variables and are the most accurate and stable controller. Briefly explained with helping of sketching, **THREE (3)** modes of controllers gain response to the error reaction by changing the controller settings.

(6 marks)

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Q3 (a) Industrial control systems used in the process industries have tended to emphasize the control continuous variables and parameters.Two basic types of variables and parameters that characterize production operations for process and manufacturing industries. Compare of **FOUR (4)** typical factor between continuous and discrete control systems.

(6 marks)

(b) Numerical control(NC) is a form of programmable automation in which the mechanical actions of a machine tool are controlled by program. Define and sketch of **TWO (2)** different types of movement are accomplished by the motion of NC system.

(4 marks)

(c) The robot moves with joint axis unit interpolation to designated position require to performs a loading and unloading operation for moving part from P1 to P2 according to **Figure Q3**. Initial robot program (1) need to move with joint interpolation from P1to position retracted 50mm in hand direction. The speed movement need to set half of the maximum speed when moves(2) with linear interpolation to P1 and wait for 0.5 seconds for the completion of arrival to the target position before closes hand. Robot need to waits 0.5 seconds and after that sets movement to maximum speed during lift up workpiece which retracted to 50mm in hand direction. Evaluate with aid of textual robot programming language to accomplish this movement.

(10 marks)

Q4 (a) A systematic procedure is presented for generating Boolean logic equations that represent the desired control action to be carried out by a discrete logic controller. A key component of the controller design is the specification of set and reset operations that define the next value of each state variable in the Boolean logic equations for the controller. Discuss with helping of truth table for XOR and NOR logic function operate on two binary inputs.

(4 marks)

(b) Construct a structured text program to transform the combining of AND LOAD and OR LOAD function from ladder programme according to **Figure Q4(b)**.

(4 marks)

(c) Automatically infusing the container with liquids A and B in order when START is pressed as shown at **Figure Q4(c)**. When it reaches the set level, two liquids will mix evenly by opening the valve to let out the liquids. Process will begin when START button is pressed, Y0 will be ON and the valve will be opened for infusing liquid A untill the level reaches the low level float sensor. X1 will ON when the level reaches the low level float sensor. Y1 will be ON and the valve will open for infusing liquid B untill

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the level reaches the high level float sensor. X2 will be ON when the level reaches the high level of float sensor and Y3 will be ON to activates the agitator. Also, timer will start count for 50 sec. Once reached 50 seconds, the timer T0 will be ON and the agitator motor Y3 will stop working and in simultaneously Y2 will be ON to drain out mixture from container in 100 sec by activating the timer T2. After 100 seconds, T1 will be ON and Y2 will be OFF which is draining process will be stopped. If an error occurs, EMERGENCY STOP button X10 will be ON to disable all the outputs .

(i) Choose according to IEC sysmbol with I/O modul to sketch an electrical diagram.

(4 marks)

(ii) Support with the necessary lines of ladder logic diagrame to operate mixing system.

(8 marks)

Q5 (a) Evaluate the **FOUR (4)** activities in production planning and control(PPC) with brief definition on each activity . Support with appropriate sketching of the four integration of PPC activities and their relationships with other functions in the firm and outside.

(10 marks)

(b) Inventory control attempts to compromise in keeping inventory at minimum level, in the extreme, zero inventory. Differentiate **THREE (3)** major sources of costs in holding inventory.

(6 marks)

(c) Annual demand for a certain part is 2500 units per year. The part is produced using a batch model manufacturing system. Annual holding cost per piece is $3.50. It takes 2.5 hr to set up the machine to produce the part, and cost of system downtime is $250/hr. Determine an economical batch quantity for this part, associated total inventory cost and how many batches are produced per year?

(4 marks)

Q6 (a) Material handling is an important activity whithin the larger system known as logistic. A great variety of material handling equipment is available commercially. Briefly explain **THREE (3)** factors that influence the design in material handling system and support with example.

(6 marks)

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(b) The disadvantage of Radio Frequency Identification (RFID) in manufacturing system is the hardware tends to be more expensive than for most other AIDC technologies. For this reason, the selection of this technology requires several justifications. Provide **TWO (2)** justifications on RFID tags of selection and give example where this technology can be applied and briefly explain function of transponder in RFID.

(5 marks)

(c) Automatic Identification and Data Capture (AIDC) refers to the technologies that provides direct entry data into computer without using a keyboard. Describe the Automatic Identification and Data Capture (AIDC) technologies below. Include the advantages and disadvantages of each technology.

(i) Matrix Symbologies Bar Codes
(ii) Magnetic Stripes
(iii) Optical Character Recognition (OCR)

(9 marks)

- END OF QUESTION -

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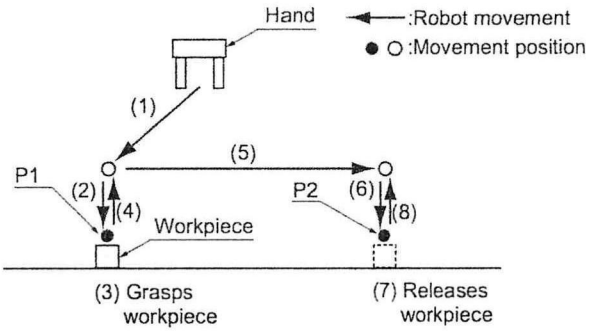

Figure Q3 : Pick and place robot

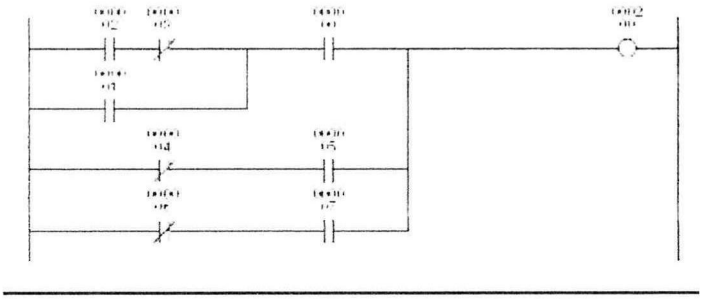

Figure Q4(b) : Logic diagram

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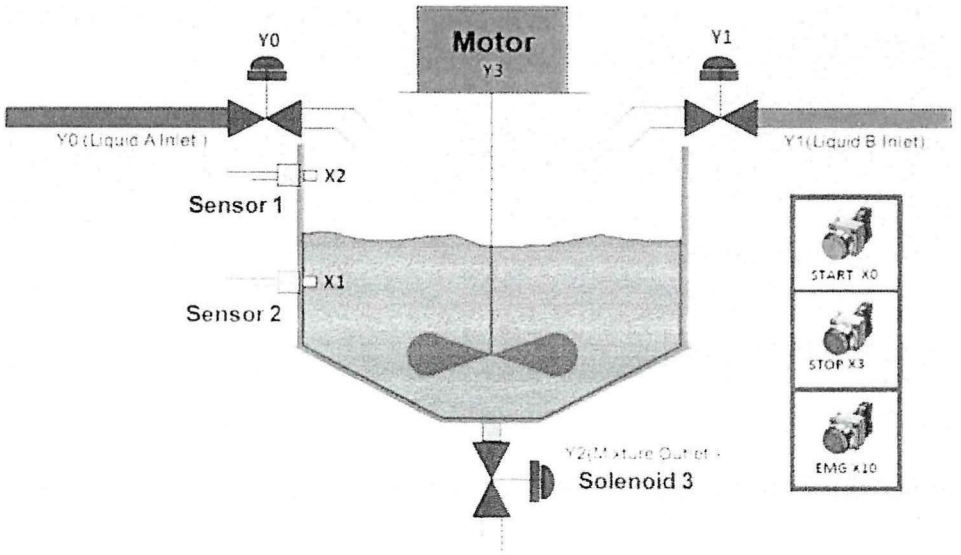

FIGURE Q4(c) : Mixing Container Liquid A and B

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