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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : MANUFACTURING CONTROL
TECHNOLOGY
COURSE CODE : BDD40803
PROGRAMME : BDD
EXAMINATION DATE : JUNE/JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ONLY **FIVE (5)** QUESTIONS
FROM **SIX (6)** QUESTIONS
PROVIDED

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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TERBUKA

- Q1** (a) A fourth industrial revolution (IR4.0) is occurring in global manufacturing based on the introduction of internet of things and servitization concepts into manufacturing companies, leading to vertically and horizontally integrated production systems. The resulting smart factories are able to fulfill dynamic customer demands with high variability in small lot sizes while integrating human ingenuity and automation. Discuss the distinguish of fully automated machine from previous type of production machines revolution and give **ONE (1)** example of applications. (5 marks)
- (b) The fifth factor that characterizes a manufacturing system is the degree to which it is capable of dealing with variations in the parts or products it produces. Sketch and discuss **THREE (3)** cases in shading of work units represents the relative degree of part or product variety in manufacturing systems with appropriate label. (9 marks)
- (c) Differentiate between **TWO (2)** different of manufacturing systems categories in single station cell, multi station systems with fixed variable routing by discussing the criteria and example with operation, automation and typical part or product variety on each categories. (6 marks)
- Q2** (a) A feedback loop is a common and powerful tool when designing 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 advantage 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 $e(t) = SP - PV > 0$, 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)

- Q3** (a) Cutter compensation is an offset or shift from centerline of the tools shaft to The cutters edge along a programmed path. Sketch and define of **TWO (2)** different of cutter compensation can be programmed in computer numerical control(CNC).
(6 marks)
- (b) Nearly all industrial robots have mechanical joints that can be classified into one of five types: two types that provide tranlational motion and three types that provide rotary motion. Sketch and define these **FOUR (4)** joint types commonly used in industrial robot construction.
(4 marks)
- (c) A pick and place robot require to performs a loading and unloading operation for moving part from P2 to P3 according to **Figure Q3**. Initial program need to set with maximum of movement speed. Hand gripper need to wait 2 seconds for the completion of arrival and after grasps of workpiece. 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 NAND and NOR logic function operate on two binary inputs.
(4 marks)
- (b) Construct the ladder logic diagram and boolean logic equation according to **Figure Q4(b)** circuit.
(4 marks)
- (c) **Figure Q4(c)** shows a workstation for the clamping and drilling of parts. When the stop button is pressed, the piece is clamped, drilled for five seconds and then released. If the stop button is pressed then both cylinders return to their retracted positions and the drill motor stops.
- (i) Choose according to IEC symsbol with I/O modul to sketch an electrical diagram for the clamping and drilling system.
(4 marks)
- (ii) Support with the necessary lines of ladder logic diagraeme to operate the clamping and drilling 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 the **THREE (3)** major sources of costs in holding inventory.
(6 marks)
- (c) Annual demand for a certain part is 1800 units per yr. The part is produced in a batch model manufacturing system. Annual holding cost per piece is \$3.00. It takes 1.5 hr to set up the machine to produce the part, and cost of system downtime is \$200/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 within 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)
- (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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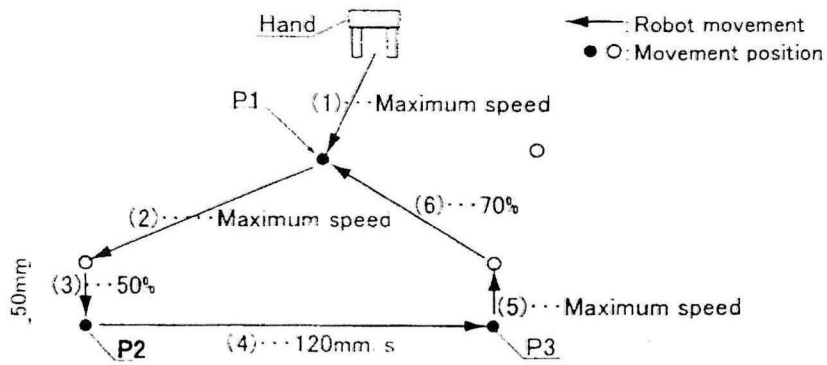


Figure Q3 : Pick and place robot

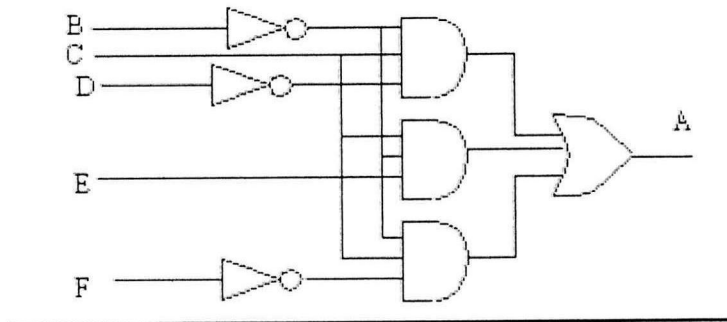


Figure Q4(b) : Logic diagram

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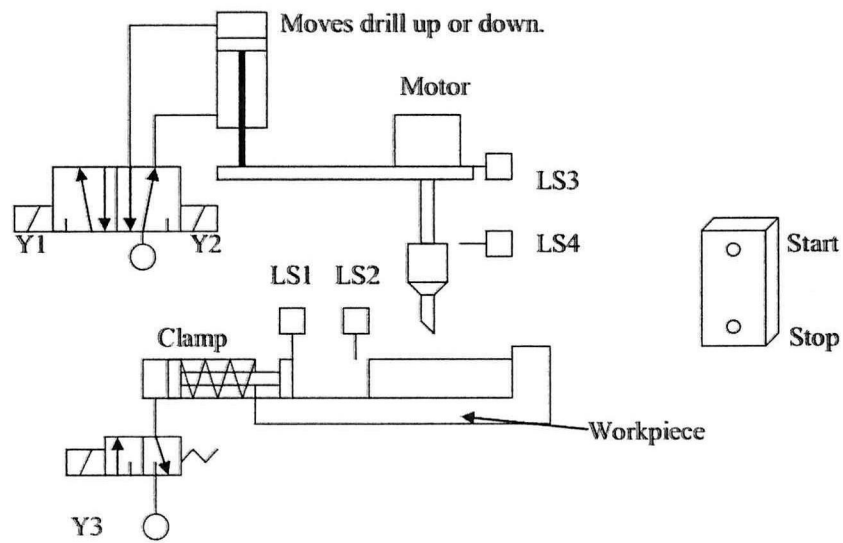


FIGURE Q4(c) : Clamping and drilling workstation