Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	MANUFACTURING CONTROL TECHNOLOGY
COURSE CODE	:	BDD40803
PROGRAMME	:	4 BDD
EXAMINATION DATE	:	JUNE 2016/JULY 2016
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS FROM **SIX (6)** QUESTIONS PROVIDED

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

Q1 (a) Manufacturing systems are divided into **THREE (3)** categories, according to worker participation. Discuss **THREE (3)** of such categories with help of sketching.

(6 marks)

(b) Compare with **TWO (2)** differences between an open and a closed loop systems. Give the examples to explain your answer.

(4 marks)

(c) The punctuality for a public transportation system is crucial in order to achieve customer satisfactions. UTHM also provides free busses for students to commute within university campus. The advancement in telecommunication technology and Global Positioning System (GPS) navigation satellites can contribute directly to public transportation system monitoring. Propose a system that able to track the buses, to predict the estimated time to arrive (ETA) in the designated station and to display the ETA in the bus station. Provide a sketch of a block diagram depicting how the system works to support your system description.

(15 marks)

Q2 (a) The concept of automated system can be applied to various levels of factory operations. Identify **FIVE (5)** levels of automation in a production plant. Support your answer with appropriate example on each level.

(5 marks)

(b) Sensors can be classified as analog and discrete. Compare the differences between such categories of sensors. Give an example of physical variables on each classification.

(5 marks)

(c) The system transfer function relates to the frequency domain system output and inputs. In other words, the system transfer function gives what is in between the system inputs and outputs. Consider the control system as shown in Figure **Q2(C)**, determine the transfer function from $R_{(s)}$ to $Y_{(s)}$ by assume $W_{(s)}$ to be equal to zero. Support your answer with block diagram reduction.

(5 marks)

(d) Actuator is one of the main component in industrial automation. Differentiate and compare three different actuotors in hydraulic, pneumatic and motor systems by discussing the working principle, advantages and disadvantages.

(10 marks)

Q3 (a) Discrete process control systems deal with parameters and variables that are discrete and that change values at discrete moments in time. What is an NAND and NOR gate? How does NAND and NOR logic function operate on two binary inputs. Produce the truth table of these two gates.

(4 marks)

(b) Construct the ladder logic diagrams for the following Boolean logic equations:

(i) $Y=(X1 + X2) \cdot X3$
(ii) $Y=(X1 + X2) \cdot (X3 + X4)$

(4 marks)

(c) An aging test workstation is required to determine the functionality and the reliability of a motor system that can rotate forward and backward. The motor requires 12V for its operation. The motor is used to produce a linear motion via rack and pinion gear system. When a start button is pressed, the motor will rotate in clockwise (CW) direction for 2 second or when it hit limit switch 1 (LS1). Once stopped, it will pause for 1 seconds. Then the motor will rotate counter clockwise (CCW) for another 2 seconds or hit the limit switch 2 (LS2). The aging test will stop after the counter hit 10000 times of operation.

(i) Draw a motion diagram for the sequence

(4 marks)

(ii) Construct a wiring diagram for the system

(3 marks)

(iii) Develop the necessary lines of ladder logic to operate the system.

(10 marks)

Q4 (a) Flexible manufacturing system(FMS) consist of several machine tools along with part and tool handling devices. Briefly explain **THREE(3)** FMS components and give the example on each compnents to perform several function.

(5 marks)

(b) While variations abound in what specifically constitutes flexibility, there is a general consensus about the core elements. Compare the flexibility criteria according to following levels of manufacturing flexibility:

(i) Material handling flexibility
(ii) Operation flexibility
(iii) Volume flexibility

(iv) Product flexibility
(v) Program flexibility

(10 marks)

(c) Supervisory Control and Data Acquisition (SCADA) is widely used in industrial processes including chemical, metallurgy, power generation and distribution. Data Access and control is among the major concerns in the implementation of SCADA system. Using appropriate diagrams answer why is Data Access needed and How does OLE for Process Control (OPC) overcome the problem?

(10 marks)

Q5 (a) In logistic industry, material handling is an important activity in it bussiness. There are many material handling equipment available in the market. Explain **TWO (2)** factors that influence the design in material handling system and support with example.

(4 marks)

(b) Describe and compare the Automatic Identification and Data Capture (AIDC) technologies below. Include the advantages and disadvantages of each technology.

(i) Radio Frequency Identification (RFID)
(ii) Bar Codes
(iii) Magnetic Stripes
(iv) Optical Character Recognition (OCR)
(v) Machine vision

(10 marks)

(c) An automated storage system for work in process have five aisles. The storage racks in each aisle are 8m high and 40m long. The storage machine for each aisle travels at a horizontal speed of 1.5m/s and vertical speed of 0.5m/s. Pick up and deposit time=15s. Assume that the number of single command cycles per hour is three times the number of dual command cycles per hour and that ste system operate at 90% utilization. Determine the throughput rate (loads moved/hour) of the AS/RS.

(11 marks)

Q6 (a) Describe the three phases of shop floor control? Provide a brief definition of each activity . Sketch the three phases integrated in shop floor system.

(10 marks)

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

(6 marks)

(c) Enterprise resource planning(ERP) is computer software system that organizes and integrates all data and business functions of an organization.Discuss **TWO(2)** group modules of ERP classification and the advantage on each groups.

(4 marks)

(d) A workpart costing RM90 is process through factory. The manufacturing lead time for the part is 10 weeks, and the total time spent in processing during lead time is 25 hours for all operations at a rate of RM30 perhour. Non operation costs total RM60 during the lead time. The holding cost rate used by the company for work in process is 25%. The plant operates 40 hours per week processed through the factory. Determine the holding cost per part during the manufacturing lead time.

(5 marks)

- END OF QUESTION –

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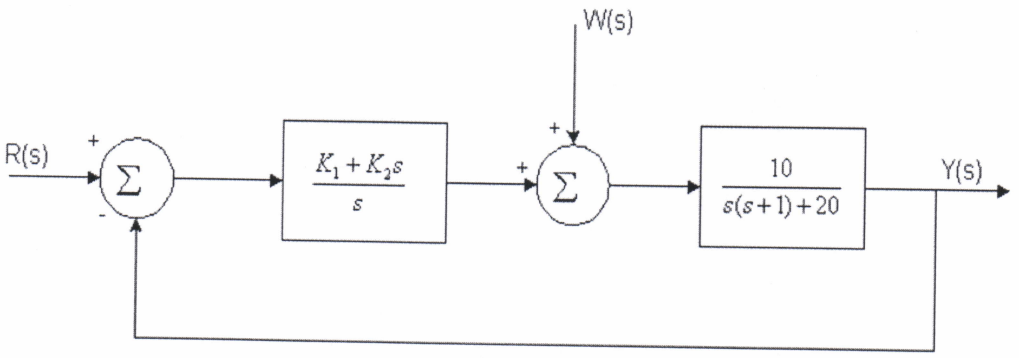

Figure Q2(c)