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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021**

COURSE NAME : MANUFACTURING CONTROL
TECHNOLOGY
COURSE CODE : BDD40803
PROGRAMME : BDD
EXAMINATION DATE : JULY 2021
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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

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TERBUKA

- Q1** (a) Cellular manufacturing (CM) is an application of group technology in which dissimilar machines or processes have been aggregated into cells, each of which is dedicated to the production of a part or product family. As process engineer, discuss **FIVE(5)** objectives in CM which is similar to those group technology. (5 marks)
- (b) Design of the machine cell is critical in CM. The cell design determines to a great degree of the performance of the cell. Compare **THREE(3)** type of machine cells and layout with aid of sketching. (6 marks)
- (c) The part machined incidence matrix according **Table Q1(c)** lists the routings of ten parts that are being considered for cellular manufacturing in a machine shop. Parts are identified by letters and machines are identified numerically. For the data given, apply the rank order clustering technique to the part-machine incidence matrix to identify logical part families and machine groups. (9 marks)
- Q2** (a) The letter symbols for the five joint types can be used to define a joint notation system for the robot manipulator. By using the notation scheme for defining manipulator configuration, sketch the robot based on TRT, VVR, OLO, TRL and LVL notation. (5 marks)
- (b) Industrial control systems used in the process industries tend to emphasize the control of continuous variables and parameters. By contrast, the manufacturing industries produce discrete parts and products, and their controllers tend to emphasize discrete variables and parameters. Compare **FIVE(5)** the differences between continuous and discrete control according to measures output, quality measures, variables, sensors and actuators. (5 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 Q2(c)**. 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)

- Q3** (a) In the context of discrete manufacturing, SCADA is the control system that directs and coordinates the activities of several interacting pieces of equipment in a manufacturing cell or system, such as a group of machines interconnected by a material handling system. Evaluate and sketch the component of SCADA relationship between supervisory and process level control .

(5 marks)

- (b) In **Figure Q3(b)**, an object stamping machine is presented that it is operating with the help of three pneumatic cylinders. The objects are received from the supply feeder, with the help of gravity and without a special mechanism. From the cylinders A, B, and C, A places and tightens the object at the stamping position. The B cylinder performs the stamping in 3s, while the C cylinder pushes the object onto a conveyor belt. A number of limit switches are necessary in order to detect the various movements of cylinders, particularly limit switches (b, c) for the A cylinder, (d, e) for the B cylinder, and (f, g) for the C cylinder. Furthermore, the limit switch “a” detects the existence of an object for stamping. In general, it is not necessary that every single or double action cylinder be accompanied by the two sensors. However, the utilization of two sensors per cylinder simplifies the implementation of the sequential logic of the physical process.

Evaluate a diagram with the connection statuses of the I/O devices and support with required ladder program.

(15 marks)

- Q4** (a) Automated guided vehicle system (AGVS) is a material handling system that uses independently operated, self-propelled vehicle guided along defined pathways. Differentiate **THREE (3)** categories types of vehicles and AGVS applications .

(6 marks)

- (b) The potential applications and benefits of RFID are only constrained by a company’s level of innovation. However, before rushing to adopt RFID technology a company can ensure the greatest rate of return and success by having in place a comprehensive strategic plan which quantifies all encompassing aspects of RFID including technology and business processes in order to deliver its benefits for maximum value. Provide **THREE (3)** justifications on RFID tags of selection and give example where this technology can be applied and briefly explain function of RFID transponder and their components.

(8 marks)

- (c) Many of Automatic Identification and Data Capture (AIDC) technologies require no human involvement in the data capture and entry process. In a post-COVID-19 business environment, it is imminent for AIDC and access control and authentication industries to address challenges with geographically concentrated manufacturing and supply chain model and restructure their existing strategies. Evaluate **THREE (3)** AIDC technology for monitoring the industrial workers healthy.

(6 marks)

- Q5** (a) The need of industry 4.0 (IR4.0) is to convert the regular machines to self-aware and self-learning machines to improve their overall performance and maintenance management with the surrounding interaction. IR4.0 aims at the construction of an open, smart manufacturing platform for industrial-networked information application. Discuss **THREE (3)** justification to understand the value of IR4.0 in manufacturing cases with example of application.

(6 marks)

- (b) To create faster, more flexible and efficient processes, the Fourth Industrial Revolution also referred to as Industry 4.0, promotes the union of physical and digital resources, connecting machines, systems and assets as a way to produce higher quality items at reduced costs.. Interpret the definition and examples of the concepts that define the future vision of IR4.0 below;

- (i) Cyber Security
- (ii) Cloud Computing
- (iii) Additive Manufacturing

(6 marks)

- (c) The internet of things (IoT) is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. Sketch and define the application and component of IoT which promise to bring immense value into our lives.

(8 marks)

- END OF QUESTION -

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	A	B	C	D	E	F	G	H	I	J
1		1		1		1				1
2	1				1		1	1	1	
3	1				1		1	1		
4					1		1	1	1	
5			1	1		1				1
6		1	1	1						1
7	1				1			1	1	

Table Q1(c) Part Machine Incidence Matrix

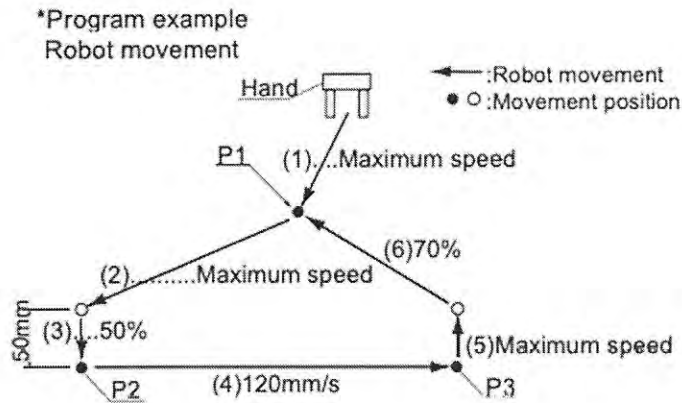


Figure Q2(c) Pick and place robot

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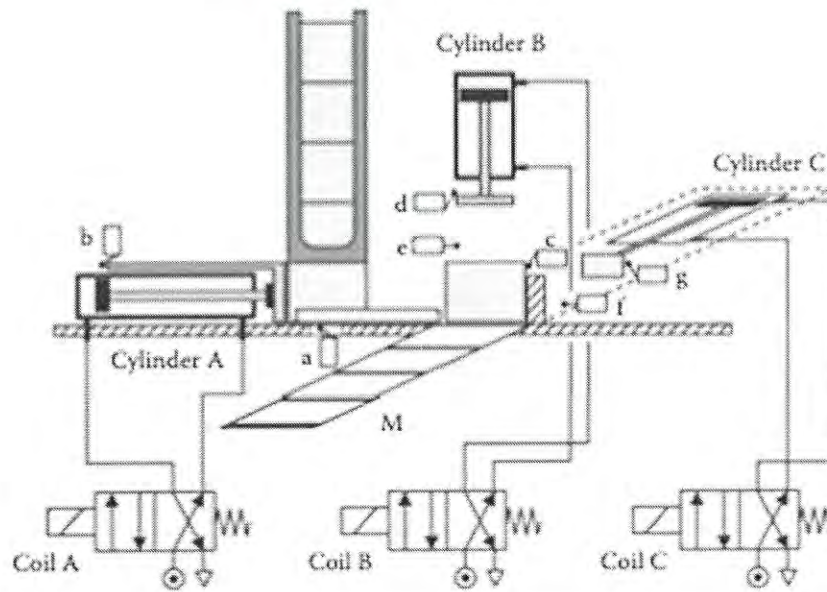


Figure Q3(b) Stamping Machine and pneumatic circuit of three cylinder