UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	MANUFACTURING CONTROL TECHNOLOGY
COURSE CODE	:	BDD 40803
PROGRAMME	:	BACHELOR DEGREE OF MECHANICAL ENGNEERING WITH HONOURS
EXAMINATION DATE	:	JUNE 2013
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTIONS	:	ANSWER **FOUR (4)** QUESTIONS FROM **FIVE (5)** QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

Q3 (a) Robot controllers can be classified into the following four categories:

(i) Limited sequence control
(ii) Playback with point-to-point Control
(iii) Playback with continuous path control
(iii) Intelligent control.

Explain each one highlighting the differences between each other.

(10 marks)

(b) The joints and links of the TRL:R manipulator in Figure Q3 have the following values : $\Theta_1= 45°$, $\Theta_2= 45°$, $\lambda_3=300$ mm, $\Theta_4 = -30°$, $L_0= 0$, $L_1 =500$ mm and $L_4=20$ mm. Determine the values of x, y and z in the world space coordinates.

(9 marks)

(c) Accuracy and repeatability for such a system have been defined as static parameters of the manipulator. However, these precision parameters are affected by the dynamic operation of the robot. Comment on such characteristics that will affect the robot's accuracy and repeatability.

(6 marks)

Q4 (a) The function of a material storage system is to store materials for a period of time and to permit access to those materials when required.
Define each performance measure below and describe its impact on the investment.

(i) Storage Capacity
(ii) Storage density
(iii) Accessibility
(iv) System throughput

(8 marks)

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

(i) Radio Frequency Identification (RFID)
(ii) Magnetic Stripes
(iii) Optical Character Recognition (OCR)

(6 marks)

Q4 (c) A 10-aisle automated storage/retrieval system (ASRS) is located in an integrated factory-warehouse facility. The storage racks in each aisle are 20m high and 100 m long. The S/R machine for each aisle travels at a horizontal speed of 2.5 m/sec and a vertical speed of 0.5 m/sec. Pickup and deposit time = 15sec. Assume that the number of single command cycles per hour is half the number of dual command cycles per hour and that the system operates at 80 %utilization.

   (i)   Sketch the layout of the system.
   (ii) Determine the throughput rate (loads moved per hour) of the AS/RS.

(11 marks)

Q5 (a) Flexible manufacturing system (FMS) is one of the machine cell types used to implement group technology. Describe the types of system flexibility in manufacturing below.

   (i)   Product flexibility
   (ii) Routing flexibility
   (iii) Volume flexibility
   (iv) Expansion flexibility

(8 marks)

   (b) What are the advantages of a mixed model line over a batch model line for producing different product styles?

(6 marks)

   (c) A dial indexing table has six stations. One station is used for loading and unloading which is accomplished by a human worker. The other five perform processing operations. The longest process takes 25 sec., and the indexing time = 5 sec. Each station has a frequency of failure = 0.015. When a failure occurs it takes an average of 3.0 min to make repairs and restart. Determine

   (i)   Hourly production rate and
   (ii) Line efficiencency.

(11 marks)

- END OF QUESTIONS -

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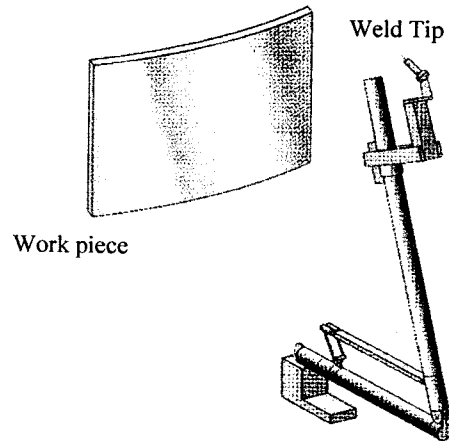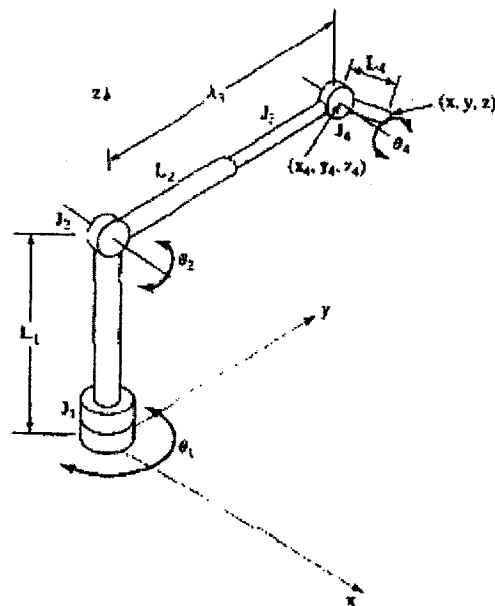   TECHNOLOGY

Figure Q1(a) : Robot Arm For Welding

Figure Q3 (b) : Robot Arm