UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	INDUSTRIAL AUTOMATION
COURSE CODE	:	BPC41203
PROGRAMME	:	3BPB
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1   Each aisle of a six-aisle Automated Storage/Retrieval System (AS/RS) is to contain 50 storage compartments in the length direction and 8 compartments in the vertical direction. All storage compartments will be the same size to accommodate standard size pallets of dimensions: $x = 36$ inches and $y = 48$ inches. The height of a unit load $z = 30$ inches. Using the allowances $a = 6$ inches, $b = 8$ inches, and $c = 10$ inches;

    (a)   Calculate number of unit loads can be stored in the AS/RS.

                              (5 marks)

    (b)   Calculate the width, length, and height of the AS/RS. The rack structure will be built 20 inches above floor level.

                              (20 marks)

Q2   (a)   Explain **FOUR (4)** general characteristics of industrial work situations that tend to promote the substitution of robots for human workers.

                              (12 marks)

    (b)   Name **THREE (3)** categories of robot industrial applications.

                              (3 marks)

    (c)   Draw and explain the five joint types used in robotic arms and wrists.

                              (10 marks)

Q3   A push-button switch used for starting and stopping electric motors and other powered devices is a common hardware component in an industrial control system. The **Figure Q3** shows it consists of a box with two buttons, one for START and the other for STOP.

    (a)   Sketch the NAND and NOT logical gate.

                              (5 marks)
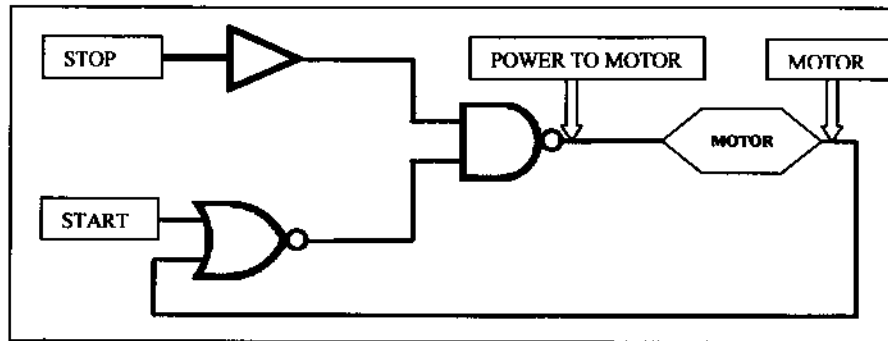
Figure Q3: Push Button Switch and Logic Network Diagram

(b) Define **EIGHT (8)** values of each logical gate variables from the **Figure Q3**.

(10 marks)

(c) If the Truth Table for the Push-Button switches (START/STOP), complete the value of the output signal at **Table Q3**.

Table Q3: Truth Table for Push-Button Switch

Start	Stop	Power to Motor	Motor
0	0		
0	1		
1	0		
1	1		
0	0		
0	1		
1	0		
1	1		

(10 marks)

Q4 A 16-station of assembly transfer line is divided into two stages of 8 stations each. All of the stations in the line have the same probability of stopping is 0.005. The ideal cycle time is 1.5 min. Assume that the downtime is constant when a breakdown occurs are 10 min.

Calculate the assembly efficiency:

(a) A two-stage line which is buffer capacity is 0.

(5 marks)

(b) For each stage line with 8 station and buffer capacity is infinity.

(5 marks)

(c)   For a two-stage line with buffer capacity is 10.

(10 marks)

(d)   For a different from part (c) and buffer capacity is 100.

(5 marks)

-END OF QUESTION-