UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME	:	INDUSTRIAL AUTOMATION
COURSE CODE	:	BPC 41203
PROGRAMME	:	3 BPB
EXAMINATION DATE	:	JUNE 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Explain automation machine.

(4 marks)

(b) Describe **THREE (3)** functions of advanced automation.

(6 marks)

(c) Illustrate the position of automation and control technologies in the production system with explanations.

(10 marks)

Q2 (a) Explain **FOUR (4)** type of joint used in robotic arms and wrists.

(8 marks)

(b) Describe **THREE (3)** notation schemes for defining manipulator configurations of the following robots:

(i) TRT:R

(4 marks)

(ii) TVR:TR

(4 marks)

(iii) RR:T

(4 marks)

Q3 Solve the below calculation by showing the solutions:

(a) 1011101110_2 convert to decimal number.

(4 marks)

(b) 5063 convert to binary number.

(8 marks)

(c) $100100100_2 - 1011111_2 + 1110110_2$; answer in binary number.

(8 marks)

Q4 A robot performs a loading and unloading operation for a machine tool.

The work cycle consists of the following sequence of activities in **Table Q4**:

Table Q4

Seq.	Activity	Time
1	Robot reaches and picks part from incoming conveyor and loads into fixture on machine tool.	5.5 sec.
2	Machining cycle (automatic)	38.0 sec.
3	Robot reaches in, retrieves part from machine tool, and deposits it onto outgoing conveyor.	4.8 sec.
4	Move back to pickup position	1.7 sec.

The activities are performed sequentially as listed. Every 30 workparts, the cutting tools in the machine must be changed. This irregular cycle takes 3.0 minutes to accomplish. The uptime efficiency of the robot is 97% and the uptime efficiency of the machine tool is 98%, not including interruptions for tool changes. These two efficiencies are assumed not to overlap. Downtime results are from electrical and mechanical malfunctions of the robot, machine tool and fixture.

Calculate,

(a) The hourly production rate

(5 marks)

(b) Tool change time

(5 marks)

(c) Machine tool uptime

(5 marks)

(d) Uptime efficiency

(5 marks)

Q5 Determine each output as follows. (Redraw the answer table into answer book)

(a) Logic Circuit No. 1

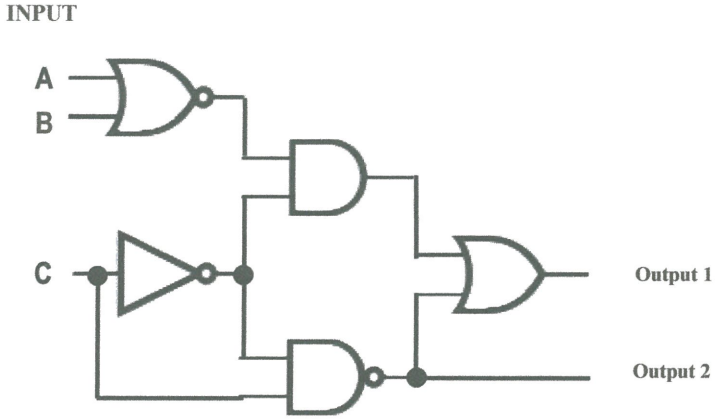

Figure Q5(a)

Table Q5(a): Answer Table Q5(a)

INPUT			OUTPUT	
A	B	C	1	2
0	0	0		
1	0	0		
1	0	1		
0	1	0		
1	0	1		

(10 marks)

(b) Logic Circuit No. 2

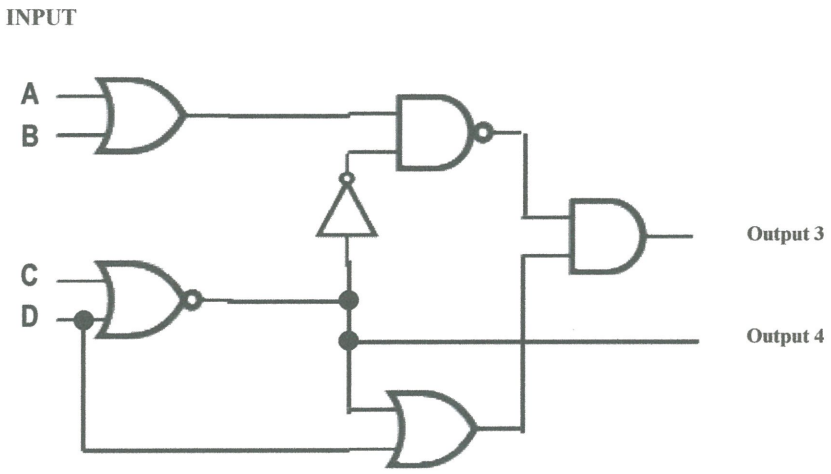

Figure Q5(b)

Table Q5(b): Answer Table Q5(b)

INPUT				OUTPUT	
A	**B**	**C**	**D**	**3**	**4**
0	0	0	0		
1	0	1	0		
1	1	1	0		
1	0	0	1		
1	1	1	1		

(10 marks)

-END OF QUESTION-