UNIVERSITI TENAGA NASIONAL

College of Information Technology

BACHELOR OF COMPUTER SCIENCE (HONS)

FINAL EXAMINATION
SEMESTER I 2014/2015

DIGITAL LOGIC DESIGN
(CSNB163)

September 2014

Time allowed: 3 hours + 10 minutes for reading

INSTRUCTIONS TO CANDIDATES.

1. The total marks for this exam is 100 marks.
2. There are **THREE (3) SECTIONS** to this paper: Section A, Section B and Section C
3. Answer **ALL** questions in the answer booklet provided.

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE INSTRUCTED TO DO SO.

THIS QUESTION PAPER CONSISTS OF 6 PRINTED PAGES INCLUDING THIS PAGE.

SECTION A: TRUE/FALSE (10 QUESTIONS, 10 MARKS)

<u>Instruction</u>: Indicate whether each of the following statements is True (T) or False (F)

1. Number system consists of an ordered set of symbols called digit.

2. Radix in number system is also known as base number.

3. The common number system that are usually being used are decimal, octal, hexadecimal and base 5.

4. If *n* is a total number of input, the possible combination of input are based on n^2 formula

5. A canonical form must always be in a consistent form.

6. XOR output will be 1 if the input number is not the same.

7. XNOR can be used as parity generator to generate an odd function.

8. NAND is consist of OR gate and NOT gate.

9. NAND and NOR gates are more frequently used in digital logic rather than AND and OR gate due to the gates are easily fabricated.

10. In K-map, the larger group of 1's that being covered is better because the gates that is used are lesser.

SECTION B: SHORT ANSWER QUESTIONS (2 QUESTIONS, 20 MARKS)

<u>Instruction</u>: Answer ALL questions. You need to show all the required working steps to show how you arrive at the solutions.

Question 1

Convert the following:

(a) 10001001_2 to decimal

[3 marks]

(b) 127.65_{10} to binary

[3 marks]

(c) $A98_{16}$ to octal

[3 marks]

(d) 100011111100_2 to hexadecimal

[3 marks]

Question 2

Perform the subtraction operations below using 2's complement.

(a) $78_{10} - 60_{10}$

[4 marks]

(b) $11001101_2 - 10101011_2$

[4 marks]

SECTION C: STRUCTURED QUESTIONS (8 QUESTIONS, 70 MARKS)

<u>Instruction</u>: Answer ALL questions. You need to show all the required working steps to show how you arrive at the solutions.

Question 1

Given the equation F = AB'C + A'(B+C) + AB (AC + B)

(a) Derive the Sum of Minterm from the equation.

[3 marks]

(b) Derive the Product of Sum from the equation.

[3 marks]

(c) Minimize the expression using basic postulate and theorem of boolean algebra.

[5 marks]

(d) Simplify the Sum of Minterm using Karnaugh Map.

[5 marks]

Question 2

Given the following equation,

F(w,x,y,z) = w'x'y'z + wxyz + w'x'y'z' + w'xy'z + w'xyz

(a) Draw the circuit diagram.

[5 marks]

(b) Implement the function in (a) using NAND gates.

[5 marks]

Question 3

(a) Design a circuit for an even parity generator, *P*, for three input variable *x*, *y*, *z*. Show the truth table, the XOR expression and the circuit diagram.

[10 marks]

(b) Design a circuit that has a parity checker, *C*, for the even parity generator in (a).

[4 marks]

Question 4

(a) What is the function of binary adder?

[2 marks]

(b) List two types of binary adder.

[2 marks]

(c) Explain the different of both of the binary adder.

[2 marks]

(d) Draw the diagram of half adder.

[4 marks]

Question 5

Construct a diagram of 2 bit by 2 bit binary multiplier.

[5 marks]

Question 6

(a) What is a binary decoder?

[2 marks]

(b) Construct the truth table for 3-to-8 binary decoder. The input name are *x,y,z* and the output name will be from D0-D7.

[5 marks]

Question 7

A logic circuit has two label input A,B and output ,F. These inputs give the output F depending on the other two input which are X and Y that make the total number of input is equal to four. If both X and Y are 0, then the output for input A and B are based on NOR. If X is 0 and Y is 1, then the output of A and B are based on XOR. If X is 1 and Y is 0, the output of A and B are based on XNOR. Else the output of A and B are based on NAND. The arrangement of input are based on Figure 1 below.

X	Y	A	B

Figure 1

Construct the truth table and Boolean expression of F.

[4 marks]

Question 8

Describe the differences between *sequential logic circuit* and *combinatorial logic circuit.*

[4 marks]

---End of questions---