THE INTERNATINONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY – HCMC

MIDTERM EXAMINATION

Date: 15 Nov 2019

Duration: 90 minutes

Subject: Digital Logic Design (EE053IU)	
Approved by Dean of School of Electrical Engineering **Mai Linh, Ph.D.**	Lecturer **Do Ngoc Hung**

READ CAREFULLY THE INSTRUCTIONS:

1. This is a semi-closed exam. Students are allowed to bring a handwritten A4 note.
2. Students are not allowed to leave the room before the exam ends. If you really want to do so, you MUST submit your paper before leaving the room at any time.
3. If there is any point in those questions that is not clear, please make assumptions and state clearly those assumptions in your work.
4. The usage of any electronic devices (electronic calculator, laptop, electronic dictionary, cell phones…) is strictly PROHIBITED.

Question 1. [26 marks]

a) Do the following conversions

i) $(AD.2)_{16}$ to decimal number

ii) $(283)_{10}$ to hexadecimal number

iii) $(11010011.001)_2$ to decimal number

iv) $(-92)_{10}$ to signed binary number using 1's complement format with minimum number of bits.

[16 marks]

b) Find $(-85)_{10} + (62)_{10}$ using two's complement format with 8-bit numbers. Then convert the result back to decimal number.

[5 marks]

c) Perform the following decimal addition in BCD numbers: $3529 + 167 = 3696$

[5 marks]

Question 2. [24 marks]

Given the following logic diagram

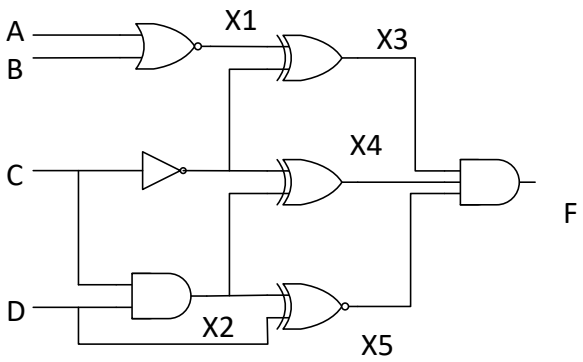

Figure 1. Logic diagram

a) Determine the output expressions of each logic gates X1, X2, X3, X4, X5, and F

[12 marks]

b) Fill the following truth table

A	B	C	D	X1	X2	X3	X4	X5	F
0	0	0	0						
0	0	0	1						
0	0	1	0						
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
1	1	1	0						
1	1	1	1						

[12 marks]

Question 3. [25 marks]

Given the following expression:

$$f(A,B,C) = \bar{A}B + ABC + \bar{B}C$$

a) Fill the following truth table

A	B	C	f
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

[5 marks]

b) Using K-map to simplify the expression $f(A,B,C)$, then implement that by using logic gates

[5 marks]

c) Implement the simplified expression by using only NAND gates

[5 marks]

d) Implement $f(A,B,C)$ by using MUX 8→1

[5 marks]

e) Implement $f(A,B,C)$ by using MUX 4→1

[5 marks]

Question 4. [25 marks]

Design a multiplier circuit takes two input binary number A_1A_0 and B_1B_0 and produces an output binary number $Y_3Y_2Y_1Y_0$ that is equal to arithmetic product of the two input numbers.

a. Draw the truth table of the circuit

[5 marks]

b. Draw the circuit diagrams using logic gates

[20 marks]