

Student ID: \_\_\_\_\_

# CS 151 Quiz 1

Name : \_\_\_\_\_ , \_\_\_\_\_  
(Last Name) (First Name)

Student ID : \_\_\_\_\_

Signature : \_\_\_\_\_

## **Instructions:**

1. Please verify that your paper contains **5 pages** including this cover.
2. Write down your Student-Id on the top of each page of this quiz.
3. This exam is **closed book**. No notes or other materials are permitted.
4. Total credits of this quiz are **25 points**.
5. To receive full credits, you must show your work clearly.
6. **No re-grades will be entertained if you use a pencil.**
7. Calculators are **NOT** allowed.

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**Q1: [Data Conversion]**

**[6 points]**

**(a)- Convert the following decimal number to binary using divide-by-2 method: (3 points)**

**97**

$$97 / 2 = 48 / 2 = 24 / 2 = 12 / 2 = 6 / 2 = 3 / 2 = 1$$

**Remainder:    1       0       0       0       0       1**

$$\Rightarrow \quad 97_{(10)} = 1100001_{(2)}$$

**(b)- Convert the following hexadecimal number to octal: (3 points)**

**F2E**

$$F2E_{(16)} = 1111\ 0010\ 1110_{(2)} = 111\ 100\ 101\ 110_{(2)} = 7456_{(8)}$$

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**Q2: [Boolean algebra]**

**[8 points]**

**Prove the following Boolean equation using Boolean algebra:**

$$\mathbf{a.(a + b + c').(a' + b' + c).(a + b + c).(a' + b' + c') = a.b'}$$

$$\left. \begin{array}{l} (a + b + c').(a + b + c) = a + b + c.c' = a + b \\ (a' + b' + c).(a' + b' + c') = a' + b' + c.c' = a' + b' \end{array} \right\} \Rightarrow a.(a + b + c').(a' + b' + c).(a + b + c)(a' + b' + c') = a(a + b)(a' + b')$$

$$a(a + b)(a' + b') = a(ab' + a'b) = ab' + aa'b = ab'$$

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**Q3: [Combinational Logic Design]**

**[8 points]**

A comparator has two inputs  $A = a_1a_0$  and  $B = b_1b_0$  and one output  $F$ . Output  $F$  becomes one whenever the value of input  $A$  is greater than or equal to the value of input  $B$ . Using truth table write the equation for output  $F$ .

You are NOT needed to simplify the function.

NOTE: The truth table has 4 inputs and one output.

$a_1$	$a_0$	$b_1$	$b_0$	$F$
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

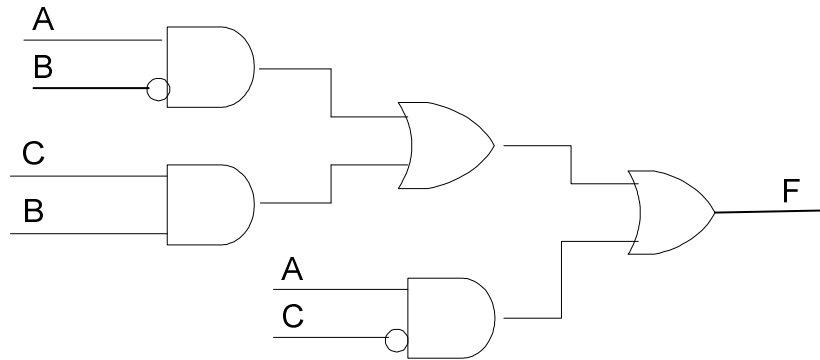
$$F = a_1' a_0 b_1' b_0' + a_1 a_0' b_1' b_0' + a_1 a_0' b_1' b_0 + a_1 a_0 b_1' b_0' + a_1 a_0 b_1' b_0 + a_1 a_0 b_1 b_0' + a_1' a_0' b_1' b_0' + a_1' a_0 b_1' b_0 + a_1 a_0' b_1 b_0' + a_1 a_0 b_1 b_0$$

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**Q4: [Combinational Circuit]**

**[3 points]**

Write the equation for function F in the circuit shown below.



$$F = AB' + BC + AC'$$