

Student ID: _____

CS 151 Quiz 1

Name : _____ , _____
(Last Name) (First Name)

Student ID : _____

Signature : _____

Instructions:

1. Please verify that your paper contains 4 **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 midterm 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.

Student ID: _____

Q1: [Data Conversion]

9 points

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

106

$$106/2 = 53/2 = 26/2 = 13/2 = 6/2 = 3/2 = 1$$

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

$$\Rightarrow 106_{10} = 1101010_2$$

(b)- Convert the following binary number to decimal: (3 points)

1 1 1 0 1 0 1 1

$$\begin{aligned} 11101011 &= 1*2^7 + 1*2^6 + 1*2^5 + 1*2^3 + 1*2^1 + 1*2^0 \\ &= 128 + 64 + 32 + 8 + 2 + 1 \\ &= 235_{10} \end{aligned}$$

(c)- Convert the following hexadecimal number to binary: (3 points)

A3B

$$A3B_{16} = (1010\ 0011\ 1011)_2$$

Student ID: _____

Q2: [Boolean algebra]

10 points

(a) Prove the following Boolean equation using Boolean algebra: (5 points)

$$xyz' + xy' + xyz + xy + yxy' = x$$

$$\left. \begin{array}{l} yxy' = 0 \\ xy + xy' = x(y + y') = x \\ xyz' + xyz = xy(z + z') = xy \end{array} \right\} xyz' + xy' + xyz + xy + yxy' = x + xy = x(1 + y) = x$$

(b) Use algebraic manipulation to convert the following equation to sum-of-product form: (5 points)

$$(a + b)(cd)' + (a + d)'b + (bc)d'$$

DeMorgan's law:

$$= (a + b)(c' + d') + (a'd')b + bcd'$$

$$= ac' + ad' + bc' + bd' + a'd'b + bcd'$$

Student ID: _____

Q3: [Combinational Logic Design]

6 points

There are three major courses X, Y and Z, and three minor courses A and B and C in a department. A student can graduate if he or she passes:

1- All the major courses from X to Z

or

2- X and Y and two of the minor courses

Write a Boolean equation to represent the graduation condition.

Hint: Use the name of the courses as the variables of your equation. i.e., X,Y, Z, A, B, C. Variable X is 1 if a student passes course X, otherwise 0.

$$F = XYZ + XYAB + XYAC + XYBC$$