Student ID: _____

CS 151
Quiz 5

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

Student ID : _____

Signature : _____

Instructions:

1. Please verify that your paper contains **6 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 **40 points.**
5. To receive credit 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: Logic Optimization [20 points]

Design a circuit that accepts a 4-bit BCD (Binary Coded Decimal) digit and outputs 1 if the number is an odd number less than 6 or greater than 8.

[Notice that BCD is one representation form in which each integer of a decimal number is represented by a 4-bit binary number. For example, binary number (**b3b2b1b0 = 0011**) represents 3 in decimal (**d = 3**)]

a. Draw the truth table for this function. **[5 points]**

b. Draw the K-map for this function. **[5 points]**

c. Show all the "**Prime Implicants**" and "**Essential Prime Implicants**". **[5 points]**

d. Simplify the function **[5 points]**

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Q2: Size-Delay trade off [20 points]

Show the trade-off in delay vs. size for the circuit representing function F.

F(a,b,c,d,e,f) = abcd + abe + cdf

You can use the following gate library showing costs for different gates:

Gate	Cost
2-input AND	**4**
3-input AND	**6**
4-input AND	**8**
2-input OR	**4**
3-input OR	**6**
4-input OR	**8**

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