

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

# ICS 151 Quiz 5

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 quiz are **50 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: Function Minimization**

**[30 points]**

Consider function F with the following equation:

$$F(a,b,c,d) = a'b'c'd' + a'bc'd' + a'bc'd + abcd + abcd' + ab'cd' + ab'c'd'$$

Assuming that  $abcd = 0011$  never happens in the input (so you can regard it as don't care situation):

a. Fill the following K-map table (5 points)

	cd			
ab				
	m <sub>0</sub>	m <sub>1</sub>	m <sub>3</sub>	m <sub>2</sub>
	m <sub>4</sub>	m <sub>5</sub>	m <sub>7</sub>	m <sub>6</sub>
	m <sub>12</sub>	m <sub>13</sub>	m <sub>15</sub>	m <sub>14</sub>
	m <sub>8</sub>	m <sub>9</sub>	m <sub>11</sub>	m <sub>10</sub>

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**b. Identify Prime Implicants and Essential Prime Implicants. (15 points)**

**Prime Implicants:**

**Essential Prime Implicants:**

**c. Using the K-map table in 1(a), write the minimized equation for function F. (10 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.

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

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

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