

Student ID: _____

CS 151 Quiz 5

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

Student ID : _____

Signature : _____

Instructions:

1. Please verify that your paper contains **7 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 **45 points**.
5. To receive credit and for possible re-grade request you must show your work clearly.
6. **For possible re-grade request make sure that your write clearly.**
7. Calculators are **NOT** allowed.

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Question 1 |State minimization|

[15 points]

- a. Reduce the number of states in the following state table using the implication table method. **(10 points)**

Present state	Next State		Output
	X=0	X=1	
A	F	C	0
B	C	E	1
C	A	E	1
D	A	C	0
E	B	G	0
F	D	C	0
G	B	C	1

Notice that this state table is for a **Moore** machine.

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b. Tabulate the reduced state table using the table provided below. **(5 points)**

Present state	Next State		Output
	X=0	X=1	

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Question 2 [Function Minimization]

[20 points]

Consider function F with the following equation:

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

Assuming that $abcd = 0000$ and $abcd = 1010$ never happen in the input (so you can regard them as don't care situations),

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

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

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2. Identify Prime Implicants and Essential Prime Implicants. (10 points)

Prime Implicants:

Essential Prime Implicants:

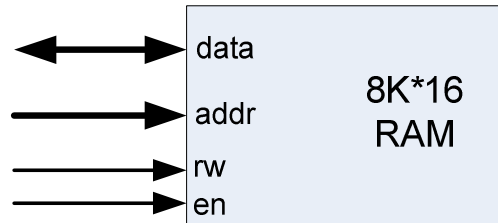
3. Using the K-map table in 1(a), write the minimized equation for function F. (5 points)

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Question 3 [Memory Design]

[10 points]

Design a 32K*32-bit RAM using 8K*16-bit RAM modules shown below.



8K*16-bit RAM Module

Use a minimum number of the following logic components in your design (*no other components may be used for this design*):

- 1) Priority Encoder
- 2) Decoder
- 3) Multiplexer

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