CS 151
Quiz 6

Name : __________________ , __________________
      (Last Name)             (First Name)

Student ID : _______________

Signature : _______________

Instructions:

1. Please verify that your paper contains **11 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 **55 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.
Question 1 [State minimization] [15 points]

a. Reduce the number of states in the following state machine using the implication table method. Which states are the same? [10 points]
b. Draw the reduced state machine below. [5 points]
For the FSM given below:
(Y is the output of the FSM)

a. Using the **standard binary** state encoding, draw the combinational circuit required to implement this FSM. Show the state table. **[10 points]**
   (HINT: The combinational logic should be optimized before drawing the circuit. USE 2-INPUT GATES ONLY)
b. Calculate the area (number of 2-input gates) of the implementation and show the critical path and calculate the critical path delay (number of 2-input gate levels) [3 points]
c. Using the one-hot state encoding, draw the combinational circuit required to implement this FSM. Show the state table. [10 points]
(HINT: The combinational logic should be optimized before drawing the circuit. USE 2-INPUT GATES ONLY)
d. Calculate the area (number of 2-input gates) of the implementation and show the critical path and calculate the critical path delay (number of 2-input gate levels) [3 points]

e. Which design (2a or 2c) is better for area (less gates)? [2 points]

f. Which design (2a or 2c) is better for speed (less gates delays)? [2 points]
Question 3 [Mealy Machine Design] [10 points]

In the following Mealy state machine, assuming that X is the input and Y is the output of the FSM, convert the state machine to a Moore machine.

Note: Transitions are of the form X/Y.