

Student ID: _____

ICS 151

Quiz 2

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

Student ID : _____

Signature : _____

Instructions:

1. Please verify that your paper contains **9 pages** including this cover and 3 blank pages.
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 **35 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.

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Q2: [FSM Design]

[5 points]

Draw the FSM diagram for a counter that counts in two modes.

In up-count mode it counts like:

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 0 \rightarrow 1 \dots\dots$

In down-count mode it counts like:

$7 \rightarrow 6 \rightarrow 5 \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 0 \rightarrow 7 \rightarrow 6 \dots\dots$

The counter should have an ENABLE input and a MODE input. When the ENABLE = 1, it counts upward if the MODE = 1, and it counts downward if the MODE = 0. When the ENABLE = 0, it stops counting.

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c. Encode the states (use a simple binary encoding) (2 points)

d. Create the state table (5 points)

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- e. Implement the combinational logic (**NO NEED** to draw the gates, just write the equations) (5 points)

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