Computer Aided Digital System Design

Lecturer: Dr. Hajar Falahati

First Semester 98-99

Homework 2 **Design Complexity & Modeling** **Deadline 1398/08/04**

1- Digital design approaches: top-down, bottom-up?

a. Define these approaches shortly.
b. Suppose that you want to design a digital system, which design approach do you take? (explain your answer with reasons)
c. Do you think there are other designing approach? (explain your answer please)

2- Design a s3-bit shift register

In every positive edge[1] of the clock, we have 2 signals: an input signal with the value of '0' or '1', and a control signal which would be '0' or '1'. The former value of control signal means the left-shift operation and the latter value of control signal means the right-shift operation.

a. Draw the FSM for this shift-register (the initial state of shift-register is '000').
b. Suppose that we have limited number of "D flip-flop" and "NAND" gates. What is the best approach (top-down or bottom-up) for designing this circuit? (explain your answer)

3- Intelligent House

Please design an intelligent house with these features:

a. Every day with sunrise, the window curtains are opened and a light music is played for waking the residents up.
b. When the temperature goes upper than 30 °C, the Air conditioner is started and wouldn't turned off until the degree reached to 24 °C.
c. With the sunset, the lights of the house are turned on.
d. When one of the residents says 'open window', all of the windows of the house are opened immediately.
e. …
f. …

You are a computer engineer who is expert in digital system design. Please design the intelligent house while considering the following requirements:

a. We ask you to add 2 more features to above list.
b. Design the whole system including 2 added features. Just draw the FSM and consider that we have one sensor for each feature except feature d. In feature d, we have a letter recognition[2] sensor. You need to design a phrase recognition[3] to receive these letters and detect the phrase.
c. If we ask you to implement this system which approach (top-down or bottom-up) do you take? Why? Explain your answer.

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[1] لبه بالا رونده
[2] تشخیص حروف
[3] تشخیص عبارت

4- Vending Machine

Draw the FSM of a vending machine with these features:

a. This machine receives 3 types of inputs: 500, 1000 and 2000 Tomans.
b. This machine also has 3 buttons for selecting Items. Water, Orange juice, and Soft Drink with the price of 2500, 3500, and 3000 Tomans, respectively.
c. The machine doesn't accept values more than 9000 Tomans.
d. After the purchase process finishes, the machine should return the remaining cash.
e. If there is no selected item after 1 minute, the machine should return the cash.
f. If the customer select an item which is valued higher than the available cash, the machine should return an error message, "Sorry, Not Enough Money".

Required Documents

- Write the answers thoroughly and clearly. Upload the answers as a PDF file on the Edmodo.
- Please note that the name of the file should be on this format: <HW2_[Full Name]_[Student ID]>.pdf

General Rules

Please consider the course rules.

- Deadlines are tight.
- You have 3-day extra time for submitting assignments/projects in the whole semester.
- 20% penalty for your late assignment/project submissions after 3-day extra time!
- Zero score for the late assignment/project submissions after uploading the solution in the course website!
- Zero score for copied assignments/projects and academic misconduct.

Deadlines

Saturday 23:59. 1398/08/04.

Contact Information

Ask your questions via the course website or send an email to:

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Good Luck