Fall 2016 – CS2420
Homework 6
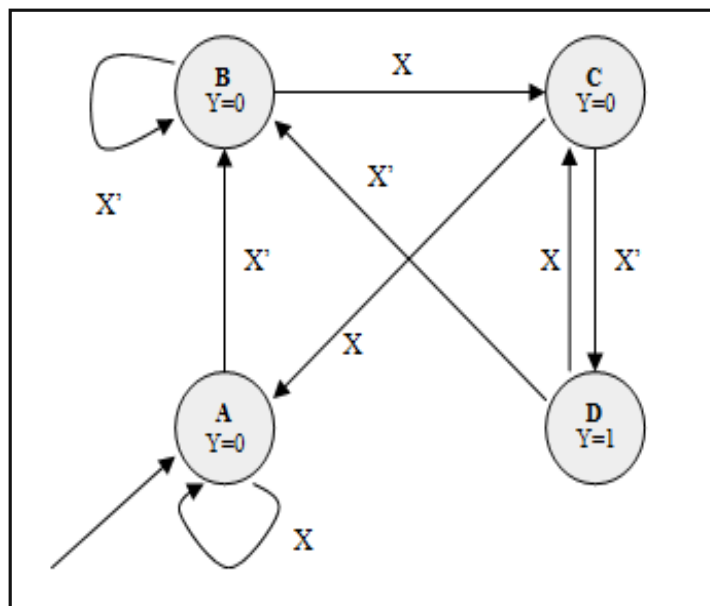# Due Date : Monday - November 16th , 2016 - Class Time

1) Design a combination logic circuit that counts the number of 1's present in 3 inputs A, B and C. Its output is a two-bit number X_1X_0, representing that count in binary (15 pts.).

   a) Write the truth table for this circuit.

   b) Using a K-Map , find the minimized logic equations for outputs X_1 and X_0

   c) Draw the corresponding logic diagram for this circuit. Label all inputs and outputs.

2) We want to design a complete sequential circuit for a sequence detector which can detect a sequence of 010 on its input X. When this sequence if detected , the output Y will be equal to 1 for exactly one clock cycle. The Finite state machine is as follows (20 points) :

a) Provide a sample input / output
b) Draw the binary coded state transition table. Considering the state encoding shown below

$$A = 00, B = 01, C = 10, D = 11$$

c) Write the simplified equations for the combinatorial logic
d) Implement the circuit using D flip-flops

3) A sequential circuit design is shown in the following diagram (20 pts.).

a) Write down Boolean equations for the next state and the output.
b) Draw the finite state machine representing this design.
c) What does this circuit do? Describe
d) Provide sample input/state/output.

4) Using Mealy Model , design a complete sequential circuit for the following candy machine   (25 pts.):

- The machine Release item after 15 cents are deposited
- The machine has a Single coin slot for dimes, nickels
- The machine will not return any changes back.

Your solution must include the following :-

- Finite state diagram
- Input / Output
- Finite state transition table
- Function equations
- Sequential logic circuit

Remarks :

- The homework does not have to be typed , however , it must be written using **pencils** only . Include the following information on **the top left** hand side of the first page :-

    - Your Name :

    - Your Roster or Serial Number :

    - Homework Number : 6
    - Due Date : November 16th , 2016

- **Make sure that you write the question first then followed by your answer.**

- The homework must also be uploaded using homework upload no later than the end of class time on the due date. Use the following name format for your file name
    LastName_FirstName_CS2420-A6.zip   or
    LastName_FirstName_CS2420-A6.pdf   or
    LastName_FirstName_CS2420-A6.doc

- For each question , you must **show** all your work.

- <u>**Missing ANY of the above items from your assignment will result in deducting 15 % of the assignment grade.   NO EXCEPTIONS.**</u>

Turn in hard copy of your assignment no later no than the end of class time on the due date. The hard copy must be **stapled**.   **No Late assignment will be accepted and a grade of zero will be assigned. If you are absent on the assignment's due date , a grade of zero will be recorded .**

- <u>**Copying the assignment from others will result in grade ZERO.**</u>