# CS120A – Homework #3

Spring 2003. Professor Hwang

Given May 29, 2003. Due June 5, 2003 at the beginning of class.

No late homework accepted.

Your work must be completely typeset with a word processor. Circuit diagrams can be drawn using any drawing program or by hand but it must be very neat. Handwritten works will **NOT** be accepted.   (12 points total)

1. Synthesize a FSM for the following state diagram using D flip-flops. All equations must be minimized as much as possible taking all the "don't cares" into consideration. The variables B and C are inputs. The variables X and Y are outputs.   (4)
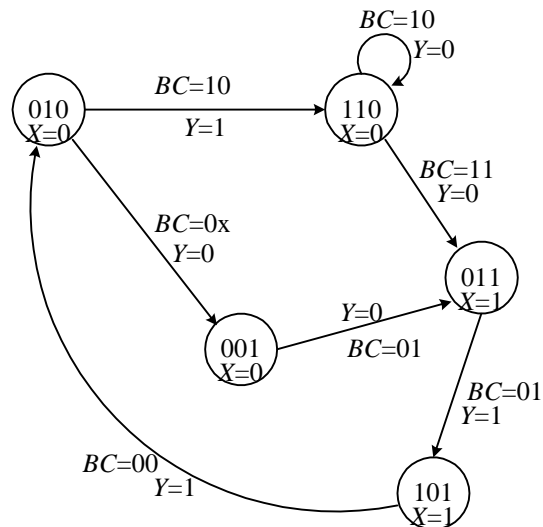
2. Perform an analysis of the FSM circuit that you derived from question 1 above. Is the resulting state diagram the same as the original state diagram given in question 1? Explain your answer.   (4)

3. Use only the components given below to construct the smallest datapath that can execute the given algorithm below. You can use each component more than once, but you can only use the components given. The datapath width is 8-bits wide, i.e., the variables and registers are all 8 bits. How many control signals and status signals are there? (4)

Load
Clear — register   *Subtract* — add / sub

add   Any basic gates such as AND, OR, NOT, NAND, etc
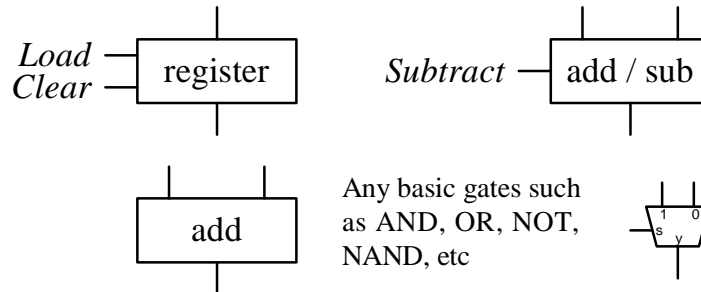
```
w = 0
x = 0
y = 0
input z
while (z ≠ 0) {
    w = w - 2
    if (z is an odd number)
        x = x + 2
    else
        y = y + 1
    z = z - 1
}
```