MA/CSSE 474   Homework #3 (33 points total) Updated for Summer, 2018

Submit to drop box on Moodle.

2.1 means Exercise 1 from Chapter 2.

You only have to turn in the problems that are not <mark>highlighted in yellow</mark>, but you should still think about the others.

Please **reread the instructions** that precede the problem list in the HW1 assignment sheet. They apply here also.

1. <mark>(t-6) 5.2(j)</mark> *aa and bb as substrings* [If you need simpler practice (and you probably do!), do some other parts of 5.2 first]. For this and other similar problems, you do not need to give the entire formal definition of your FSM.
    A transition diagram or transition table is sufficient.

2. <mark>(t-6) 5.2(l)</mark> *no more than one pair of consecutive 0's and 1's* (that's part *el*, the letter that comes between *k* and *m* in the English alphabet)

3. 5.3 *Rock, Paper, Scissors*

4. <mark>(t-3) 5.4</mark> *L(M) contains ε* The answer is simple and straightforward, so don't look for anything complicated or tricky.

5. <mark>(t-6)</mark> *divisible by 3* Let L be {w∈{0, 1}* : ∃n,k∈ℕ (w = <n> ∧ n = 3k)}. I.e. the set of binary representations of natural numbers that are divisible by 3. Leading zeroes are allowed. Recall that 0∈ℕ.
    Draw the transition diagram or a transition table for a DFSM that accepts L. [Hint: think about remainders *mod* 3. Another hint: There are not many states].

6. 5.5 *determine membership in L(M)*

7. 5.6(a) *FSM to accept a simple language*

8. <mark>(t-6) 5.6(c)</mark> *decimal encoding of integer with a substring divisible by 3* Note that this one is decimal, while problem 5 is binary. Also notice the "contains a substring" part.

9. <mark>(t-6) 5.7</mark> *three identical symbols in a row*

*S*ome past questions and answers from Piazza:

Minimize FSM?

Q: Should we try to minimize our FSM on the homework or does it matter?
A: Trying to write your DFSMs with as few states as you can is a good idea, but it is not required for this assignment. Later this week we will look at an algorithm for doing that.

Pair of consecutive 1s/0s Problem 2

Q: For Problem #2 in HW 3 (2 l), does 111 constitute as 1 or 2 pairs of consecutive 1s? You could count the 2nd 1 as the 2nd 1 in the 1st pair or the 1st 1 in the 2nd pair.

A: There are indeed two pairs in the three 1's.

HW3 Problem 5: Are the binary strings fed with the most significant bit first?

Q: Does it not matter?

A: Unless a specific problem specifies otherwise, assume that binary strings are written with the most significant bit/digit first.

Empty string in HW 3 problem 5

Q: For problem 5 (binary representations of integers divisible by 3), can we consider the empty string a representation of 0, or should we avoid this?

A: The machine should not accept the empty string.