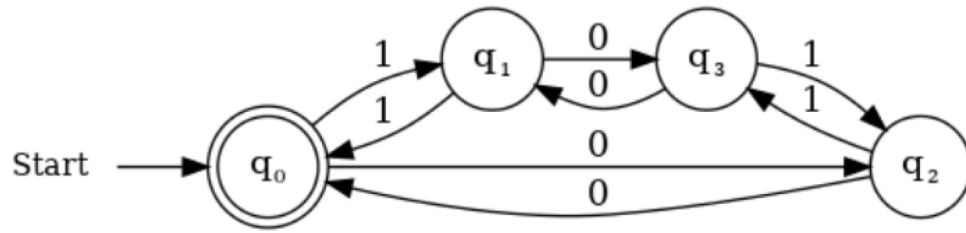# CS580 Homework 2

### Fall 2024
### August 28, 2024
### (Due 4:10pm, September 4, 2024)

Email homework assignments to ldojcsak@vols.utk.edu by the beginning of class time.

For each problem let $\sum = \{0, 1\}$.

1. Draw the transition diagram of a DFA that accepts each of the following languages.

    a. $\{\lambda, 1, 10, 11, 100\}$

    b. All strings that do not contain 111 as a substring.

    c. All strings beginning with a 1 that, interpreted as the binary representation of an integer (most significant bit on the left), are congruant to 2 mod (5) or 3 mod (5).

    d. All strings of length at least four whose final three symbols contain an odd number of 1's.

2. Give a regular expression that denotes each of the following languages.

    a. All strings in which at least one 1 is not immediately preceded by a 0.

    b. All strings in which the second symbol from the start is a 1 and the second symbol from the end is a 1.

3. Construct a DFA equivalent to the following regular expressions.

    a. $(00 + 1)^*(11 + 0)^*$

    b. $((0 + 1)(0 + 1))^* + ((0 + 1)(0 + 1)(0 + 1))^*$

4. Describe in English the following regular expression: $0^*1(0 + 10^*1)^*$

5. Give an equivalent regular expression for each DFA in the figures below.

a.



b.