SUNY at Stony Brook **Homework #3**
CSE 303 - Intro. to Theory of Computation **September 13, 2022**

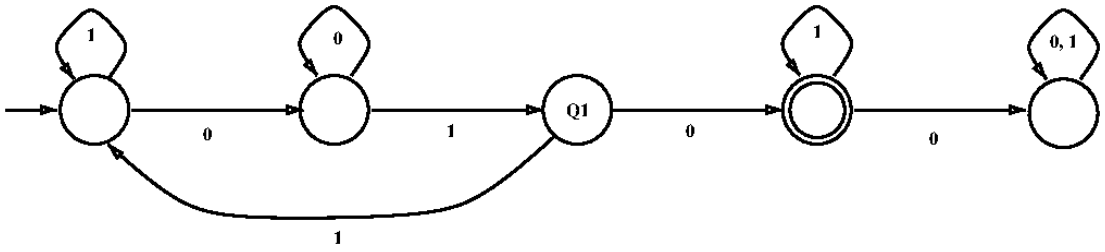
Homework 2 — Due: Tuesday, September 20, 2022

Please submit your work on Brightspace, in PDF format only.

1. Prove that if A, B, and C are any three at-most-countable sets, not necessarily infinite or disjoint, then their union is also at most countable.

2. Prove by induction: Every partial order on a nonempty finite set has at least one minimal element. (The induction will be on the number n of elements in the finite set.) Is the same statement true for nonempty infinite sets? Justify your answer.

3. Describe in English the language recognized by the following finite automaton:



4. Construct a finite automaton that recognizes the following language: The set of strings over the alphabet $\{1, 2, 3\}$ in which the sum of all symbols is divisible by 5.

5. Use a product automaton construction to construct a finite automaton that recognizes the following language: The set of strings over the alphabet $\{0, 1\}$ that either begin with 010 or end with 101.

6. Let M be a (deterministic) finite automaton. Under exactly what circumstances is ϵ in $L(M)$? Prove your answer.