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CSC:341 Spring 2024

Lab #7B

Due: March 9, 2024

#1

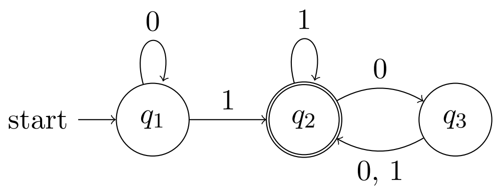
Encode each of the following objects to a string representation with $\Sigma = \{0, 1\}$. In other words, how might each of these objects be represented as inputs to a Turing machine?

1. The number 7
2. The number -15 (use a leading 1 to denote negative numbers).
3. The set $A = \{0, 1, 2\}$
4. The 3-tuple $(3, 4, 5)$
5. The directed graph $G = (V, E)$ where
   - $V = \{0, 1\}$, meaning V has vertices labeled 0 and 1, and
   - $E = \{(0, 1), (1, 0)\}$, meaning 0 has an edge to 1 and 1 has an edge to 0.

   N.b. you may need to use multiple delimiters depending on your choice of representation.

#2

Let M be a DFA with the following state diagram.



Recall that the language

$$A_{\text{DFA}} = \{\langle D, w\rangle \mid D \text{ accepts input string w}\}$$

can be decided by a Turing machine. Which of the following pairs are in A_{DFA}?

1. $\langle M, 0100\rangle$
2. $\langle M, 011\rangle$
3. $\langle M, 000\rangle$
4. $\langle M\rangle$ (That is, M paired with the empty string.)

#3

Consider the language:

$$\text{E}_{\text{DFA}} = \{\langle D\rangle \mid D \text{ is a DFA and } \epsilon \in L(D)\}$$

Argue why E_{DFA} is decidable. That is, give a (very) high-level description of a TM that decides E_{DFA}.