CSC 404 - Activity/Project 6 - Name:

Problem 1. Consider the (non-regular) language of all bit strings that contain 0s followed by an equal number of 1s, i.e.,

$$L = \{\emptyset, \texttt{01}, \texttt{0011}, \texttt{000111}, \texttt{00001111}, ...\} = \{\texttt{0}^{\texttt{n}}\texttt{1}^{\texttt{n}} \mid \texttt{n} \geq \texttt{0}\}$$

a. Describe how a Turing machine, M_1, would accept the string `000111`. (I.e., sketch out how the machine would move through the string and what the head would read/write.) If you want, there is more space on the back to show additional steps (if you want to show every move).

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

···	⊔	⊔	0	0	0	1	1	1	⊔	⊔	···

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b. Construct a state diagram for Turing machine M_1.

c. Implement the Turing Machine in turingmachine.io. Include a screenshot or .yaml file.
Test it with the strings `000111` (should accept), `0000111` (should reject), and `0001111` (should reject).

d. (Bonus) Construct another Turing Machine that recognizes L.

e. (Bonus) Construct a Turing Machine that recognizes the language of `0` followed by twice as many `1s` (e.g., `001111` is accepted).

Problem 1.a - Extra Space

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