ComS 331   Spring 2024   Name: Aren Ashlock

1. Specify in detail a (deterministic) Turing machine that accepts the language L of even-length palindromes over $\{a, b\}$ (your Turing machine must halt on input w if, and only if, $w \in L$).

   You must represent the TM as a graph showing the initial state (as we do in a DFA) and labeling the edges with the corresponding transition: for example, if $\delta(s, a) = (t, b)$, or (t, L), or (t, R), then label the edge from s to t with "a, b", or "a, L", or "a, R", respectively.

   Remember: your machine is deterministic, so it must have a well-defined behavior for each input symbol, i.e, a, b, and $\#$, and each state (other than the halting state h).

   $a, R; b, R$

   A $\xrightarrow{\#, L}$ B $\xrightarrow{\#, \#}$ h

   $b, \#$

   $a, \#$ $\#, L$

   $a, a; b, b$ J $a, R; b, R$ G   K $a, a; b, b$

   $\#, L$ $\#, R$ $\#, L$

   $a, L; b, L$ C   L   D $a, L; b, L$

   $\#, R$ $a, \#$ $a, a; b, b$ $b, \#$ $\#, R$

   E   I   F

   $b, \#; \#, \#$ $a, \#; \#, \#$

   $a, \#; b, \#; \#, \#$