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HW #5
CSCI 338
4-1-2016

1. 3.2d p.187

M_1 recognizes $B = \{w\#w \mid w \in \{0,1\}^*\}$ so the input, 10#11, should be rejected:

$q_1$10#11	q_7x0#x1
x$q_3$0#11	x$q_1$0#x1
x0q_3#11	xxq_2#x1
x0#$q_5$11	xx#q_4x1
x0q_6#x1	xx#x$q_4$1
x$q_7$0#x1	xx#x1q_{reject}

2. 3.2e p.187

M_1 recognizes $B = \{w\#w \mid w \in \{0,1\}^*\}$ so the input, 10#10, should be accepted:

$q_1$10#10	x$q_1$0#x0	xxq_1#xx
x$q_3$0#10	xxq_2#x0	xx#$q_8$xx
x0q_3#10	xx#q_4x0	xx#xq_8x
x0#$q_5$10	xx#x$q_4$0	xx#xxq_8
x0q_6#x0	xx#$q_6$xx	xx#xxq_{accept}
x$q_7$0#x0	xxq_6#xx	
q_7x0#x0	xq_7x#xx	

4.

* = wildcard and therefore can be any symbol of $\Gamma = \{0, b, \#\}$.

$$\delta(q_0, \#) = (q_1, \#, R)$$
$$\delta(q_1, 0) = (q_1, 0, R)$$
$$\delta(q_1, b) = (q_1, b, R)$$
$$\delta(q_1, \#) = (q_2, \#, R)$$
$$\delta(q_2, b) = (q_3, \#, L)$$
$$\delta(q_3, \#) = (q_4, \#, L)$$
$$\delta(q_4, b) = (q_5, b, R)$$
$$\delta(q_5, *) = (q_7, b, L)$$
$$\delta(q_4, 0) = (q_6, 0, R)$$
$$\delta(q_6, *) = (q_7, 0, L)$$
$$\delta(q_7, 0) = (q_4, 0, L)$$
$$\delta(q_7, b) = (q_4, b, L)$$
$$\delta(q_4, \#) = (q_8, \#, R)$$
$$\delta(q_8, *) = (q_{accept}, b, L)$$

5. 3.5d p.188

No, by definition a Turing machine has q_{accept} and q_{reject} where $q_{accept} \neq q_{reject}$. Additionally, the TM must have an initial state or the machine would immediately halt upon execution. Therefore, a TM requires a minimum of three states.