Quiz 3 practice questions

1. Presume the input alphabet $\Sigma=\{0,1\}$. For the following TMs, provide an informal description. As a harder challenge, you can provide a state diagram as well. You may assume the TM always starts at the first non-blank character, and that blanks are represented as ~.

a. Decide whether input string is a palindrome: $w=w^{Reverse}$
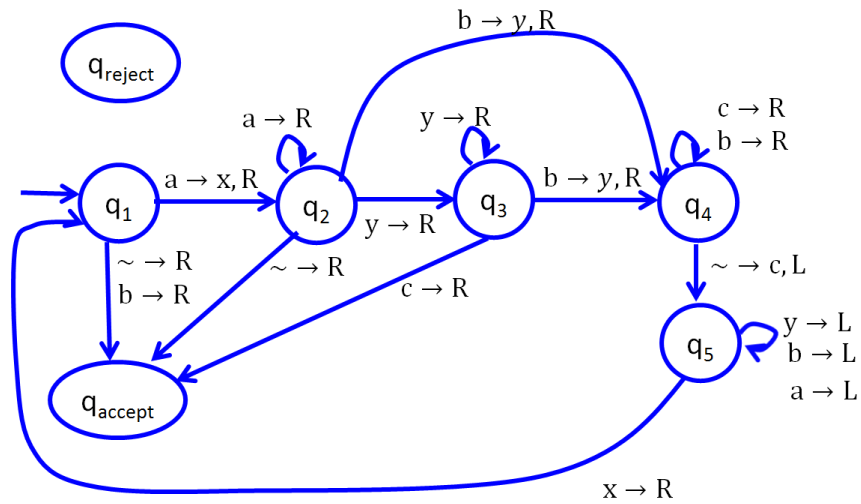
b. Decide $\{ \Sigma^n\#\Sigma^m \mid n>m>0 \}$

c. Transducer that adds 01 to the end of the input string. E.g., if the tape started with 0100, the TM would conclude with the string 010001 on the tape. **I recommend you write the state diagram implementation for this one. It's relatively easy and something similar could (maybe) appear on the quiz.**

2. Presume the input alphabet $\Sigma=\{a,b\}$. Provide an informal description and state diagram for the following PDAs

a. Recognize the language $\{a^n(bb)^n \mid n>0 \}$

b. Recognize the language $\{ ab*a \}$

3. Consider the following TM.

q_{reject}

$b \rightarrow y, R$

$a \rightarrow R$ $y \rightarrow R$ $c \rightarrow R$
                                        $b \rightarrow R$

$a \rightarrow x, R$ q_1 q_2 $b \rightarrow y, R$ q_3 q_4
$y \rightarrow R$

$\sim \rightarrow R$ $\sim \rightarrow R$ $\sim \rightarrow c, L$
$b \rightarrow R$

$c \rightarrow R$

q_{accept} q_5 $y \rightarrow L$
                      $b \rightarrow L$
                      $a \rightarrow L$

$x \rightarrow R$

Presuming we start with the first (left-most) non-~ character on the tape, list the configurations the TM goes through for each input below. If there are more than 6 configurations, just list the first 6.

a. aab

b. abb