Chapter 3 Classwork

1. Show how the following Turing Machine M accepts or rejects this string: aabbbccccccc. M decides the language $C = \{a^i b^j c^k | i \times j = k \text{ and } i, j, k \geq 1\}$.

   TM M = "on inputs w ∈ {a, b, c}*

   i. Scan the input from left to right to determine whether it is a member of $a^+b^+c^+$, reject if not.

   ii. Scan left.

   iii. Mark an unmarked a. If there are no a's left to mark, go to Step vi.

   iv. Scan to the right until a b occurs. Shuttle between the b's and c's, marking one of each until all b's are marked. If all c's have been marked and some b's remain, reject.

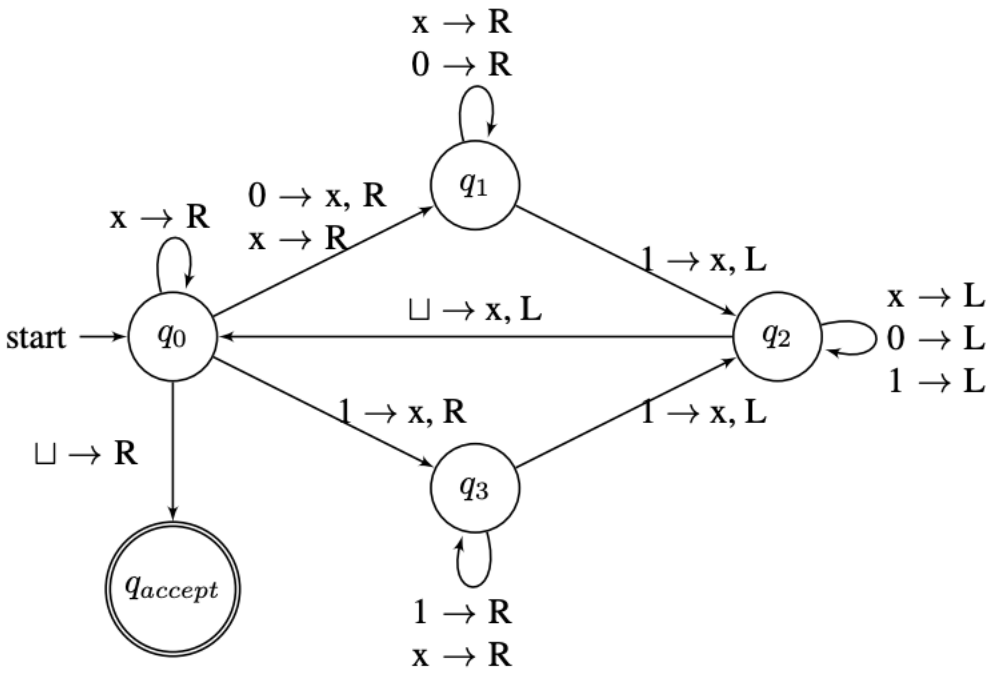
   v. Unmark all the marked b's and repeat Step ii.

   vi. Scan right to see if all c's are marked. If so, accept; otherwise, reject.

2. Give an implementation-level description of a Turing Machine that describes L, where L accepts the alphabet Σ = {0, 1} and triples the string on the tape, for example, given 0100 it would write 010001000100. L = {0, 1}*.

3. Give an implementation-level description of a Turing Machine that describes L, where L accepts strings that contain ***aba*** where the alphabet is $\Sigma = \{a, b\}$.

Given the Turing Machine below, decide if the given string is in the language. Show the configuration at each step.



4. String 01101
5. String ε
6. String 1111