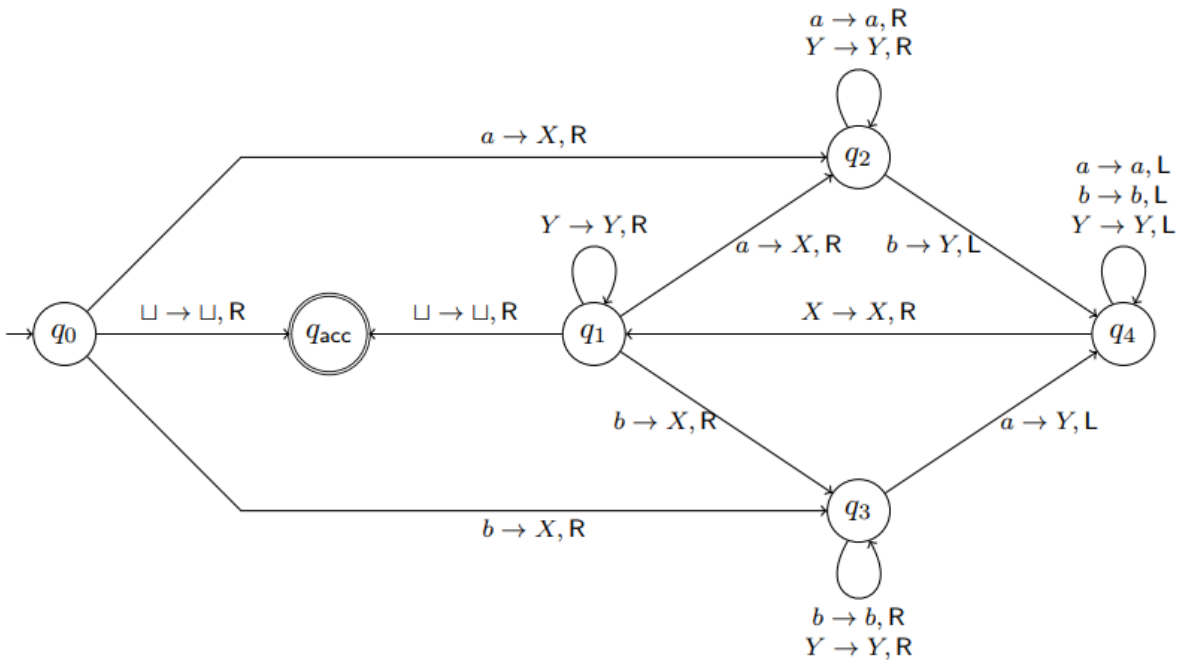


Problem 1

Consider the following Turing Machine M with input alphabet $\Sigma = \{a, b\}$. The reject state q_{rej} is not shown, and if from a state there is no transition on some symbol then



1. Give the formal definition of M as a tuple. [3 points]
2. Describe each step of the computation of M on the input $baabab$ as a sequence of instantaneous descriptions. [3 points]
3. Describe the language recognized by M . Give an informal argument that outlines the intuition behind the algorithm used by M justifies your answer.

Problem 2

For $\Sigma = \{\#, a, b\}$, design a Turing machine to recognize the language $L = \{a^{2n}\#b^n \mid n \geq 0\}$

Problem 3

For $\Sigma = \{\#, a, b\}$, design a Turing machine to recognize the language $L = \{ww^R \mid n \geq 0\}$

Problem 4

Prove that the following languages are decidable.

$A_{DFA} \{ \langle D, w \rangle \mid D \text{ is a DFA that accepts input string } w \}$