# CS 6041 Theory of Computation

# Homework 5

1. For the following Turing machine M = (Q, Σ, Γ, δ, q1, qaccept, qreject) with

Q = {q1, . . . , q8, qaccept, qreject},

Σ = {0, 1, #},

Γ = {0, 1, #, x, ␣},

and transitions below. (25 points)

A picture containing chart

Description automatically generated

The reject state and the transition to qreject is not highlighted in the above figure. If there is no outgoing transition for a given state, it goes to qreject and the head does not change the tape and just moves right.

Please show the sequence of configurations when the Turing machine input tape is string 1#1.

Answer:

1. Give implementation-level descriptions of Turing machines that decide the following languages over the alphabet {0,1}.

{w| w contains twice as many 0s as 1s} , (25 points)

Answer:

1. Let AεCFG = {⟨G⟩| G is a CFG that generates ε}. Show that AεCFG is decidable. (25 points)

Answer:

1. In the chapter of regular language, we know that the DFA is equivalent with NFA and regular expression (RE). For the problem to determine whether a given DFA and RE are the same, C = {<D, R> | D is a DFA and R is a RE that L(D) = L (R)}, please prove that C is decidable. (25 points)

Answer: