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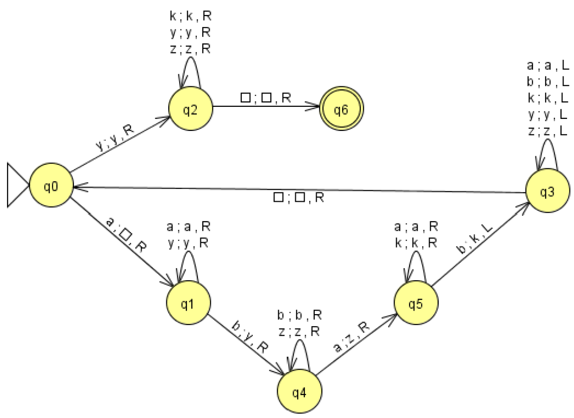
May 17, 2022
CS 321 Assignment 8

Section 9.1 (Question 1):

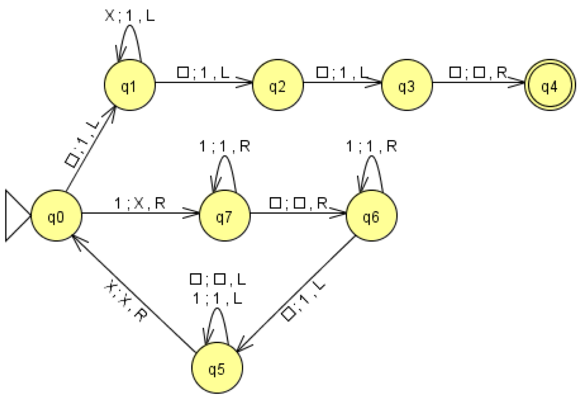


Input	Result
a	Reject
b	Reject
ab	Reject
ba	Reject
abab	Accept
baba	Reject
aabbaabb	Accept
aabaabb	Reject
ababab	Reject
aaabbbaaabbb	Accept

States: {q0, q1, q2, q3, q4, q5, q6}
Input Alphabet: {a, b}
Tape Alphabet: {a, b, k, y, z}
Blank Symbol: {□}
Initial State: {q0}
Final State: {q6}
Transitions:

δ (q0, a) = {(q1, □, R)}
δ (q0, y) = {(q2, y, R)}
δ (q1, a) = {(q1, a, R)}
δ (q1, b) = {(q4, y, R)}
δ (q1, y) = {(q1, y, R)}
δ (q2, □) = {(q6, □, R)}
δ (q2, k) = {(q2, k, R)}
δ (q2, y) = {(q2, y, R)}
δ (q2, z) = {(q2, z, R)}
δ (q3, □) = {(q0, □, R)}
δ (q3, a) = {(q3, a, L)}
δ (q3, b) = {(q3, b, L)}
δ (q3, k) = {(q3, k, L)}
δ (q3, y) = {(q3, y, L)}
δ (q3, z) = {(q3, z, L)}
δ (q4, a) = {(q5, z, R)}
δ (q4, b) = {(q4, b, R)}
δ (q4, z) = {(q4, z, R)}
δ (q5, a) = {(q5, a, R)}
δ (q5, b) = {(q3, k, L)}
δ (q5, k) = {(q5, k, R)}

Section 9.1 (Question 2):



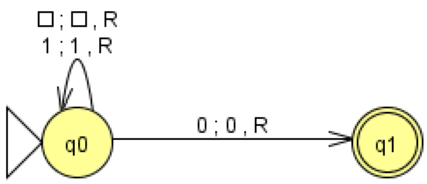
Input	Output	Result
1	11111	Accept
11	1111111	Accept
111	111111111	Accept
1111	11111111111	Accept
11111	1111111111111	Accept
111111	111111111111111	Accept
1111111	11111111111111111	Accept

States: {q0, q1, q2, q3, q4, q5, q6, q7}
Input Alphabet: {1}
Tape Alphabet: {1, X}
Blank Symbol: {☐}
Initial State: {q0}
Final State: {q4}
Transitions:

δ (q0, 1) = {(q7, X, R)}
δ (q7, 1) = {(q7, 1, R)}
δ (q7, ☐) = {(q6, ☐, R)}
δ (q6, 1) = {(q6, 1, R)}
δ (q6, ☐) = {(q6, 1, L)}
δ (q5, ☐) = {(q5, ☐, L)}
δ (q5, 1) = {(q5, 1, L)}
δ (q5, X) = {(q5, X, R)}
δ (q0, ☐) = {(q1, 1, L)}
δ (q1, X) = {(q1, 1, L)}
δ (q1, ☐) = {(q2, 1, L)}
δ (q2, ☐) = {(q3, 1, L)}
δ (q3, ☐) = {(q4, ☐, R)}

Section 9.1 (Question 3):

Let’s use the function f(x) = 3x + 3, where x is a positive integer represented in unary. The tape will halt the run if there is a ‘0’ present somewhere within the tape.
We get the following turing machine:



Input	Result
0	Accept
1	Cancelled
01	Accept
10	Accept
111	Cancelled

Although we cannot test this turing machine in JFLAP, we can see that whenever there is a ‘0’ present within the input, the tape halts and accepts. Meanwhile, when there is no ‘0’ present within the input, the tape repeatedly iterates and eventually cancels.

States: {q0, q1}
Input Alphabet: {0, 1}
Tape Alphabet: {□, 0, 1}
Blank Symbol: {□}
Initial State: {q0}
Final State: {q1}
Transitions:

δ (q0, □) = {(q0, □, R)}
δ (q0, 0) = {(q1, 0, R)}
δ (q0, 1) = {(q0, 1, R)}