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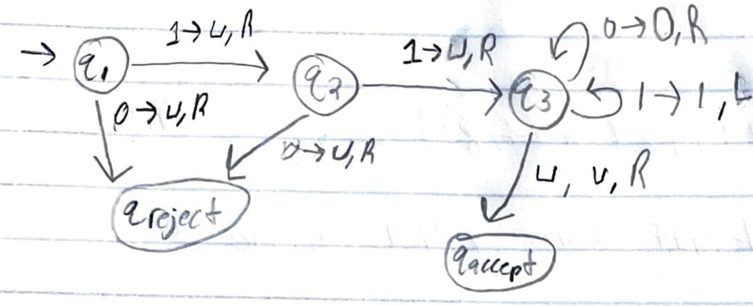
Homework 6

1.) Design a TM M_1:

$\{w \in \{0,1\}^* \mid w \text{ ends in } 10 \text{ or } 111\}$

d.)



a.) If both 1's than, it will go to an accept state, otherwise reject

b.) 1.) Scan the input into the starting state
2.) If its a 1, scan to the right, with a blank. If 0, scan to reject state
3.) In q_2, if 1, scan to the right with a blank, If 0, scan to reject state
4.) Accept if both 1s, otherwise reject

c.) $Q = \{q_1, q_2, q_3\}$
$\Sigma = \{0, 1\}$
$\Gamma = \{0, 1, \sqcup\}$
$\delta = \{R\}$
$q_0 = q_1$, start state
q_{accept} = accept state
q_{reject} = reject state

e.) i.) 101 (reject)

$q_1 101$, $\sqcup q_{reject} 01$ In the TM, if a 0 appears from q_1, than it rejects.

or

$q_1 101$, $\sqcup q_{reject} 01$, $\sqcup q_2 01$, $\sqcup\sqcup q_{reject} 1$

ii.) 111 (accept)

$q_1 111$, $\sqcup q_2 11$, $\sqcup\sqcup q_3 1$, $\sqcup q_3 \sqcup 1$, $\sqcup\sqcup q_{accept} \sqcup 1$ I couldn't figure out how to remove the last 1.

2.) Design a TM M_2:

$L_2 = \{a^n b^m a^n b^m \mid n, m \in \mathbb{Z}$ and $n, m \geq 1\}$

a.) Starting with a number of a's, than a number of b's, than a number of a's, than a number of b's.

b.) 1.) Scan Input into starting state
2.) If its a, scan to the right, with a blanks. If b, go to reject state.
3.) For next state, if its b, scan to the right, with a blank. If a, go to reject state.
4.) Repeat steps 3 and 4.

3.) Explain why the following is not a description of a legitimate TM.

The description is too vague/broad. Trying all possible settings is really hard because there are too many. It would also take a very long time to go through infinite settings. "otherwise, reject" is another problem because there are infinite settings. It could take a while to find that one setting that equals 0.

5.) Find the integral roots of:

$$f(x) = 6x^3 + 4x^2 - 7x + 2$$

$$2x^2(3x + 2) - (7x + 2)$$

$2x^2 = 0$	$3x + 2 = 0$	$7x + 2 = 0$
$x = 0$	$3x = -2$	$7x = -2$
	$x = -2/3$	$x = -2/7$

The integral roots are: $x = 0, -2/3, -2/7$

4.) Show that the collection of decidable languages is closed under the operation of concatenation

L_1 and L_2 are decidable languages. The concatenation of them would be $L_1L_2 = \{ab \mid b \in L_1$ and $a \in L_2\}$

Turing machines would exist for these 2 languages because they are decidable. Proving that a collection of decidable languages are closed under concatenation.