Formal Languages Homework 9

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1 Problem 8.2.1

State	Symbol 0	1	X	Y	B
q_0	(q_1, X, R)	–	–	(q_3, Y, R)	–
q_1	$(q_1, 0, R)$	(q_2, Y, L)	–	(q_1, Y, R)	–
q_2	$(q_2, 0, L)$	–	(q_0, X, R)	(q_2, Y, L)	–
q_3	–	–	–	(q_3, Y, R)	(q_4, B, R)
q_4	–	–	–	–	–

Show the ID's of the Turning Machine of Fig. 8.9 if the input tape contains:

1.1 a). 00

1.2 b). 000111

1.3 c). 00111

2 Problem 8.2.2

Design Turing machines for the following languages:

2.1 c). $\{ww^R \mid w$ is any string of 0's and 1's $\}$

3 Problem 8.2.5

Consider the Turing Machine

$$M = (\{q_0, q_1, q_2, q_f\}, \{0, 1\}, \{0, 1, B\}, \delta, q_0, B, \{q_f\})$$

Informally, but clearly describe the language $L(M)$ if δ consists of the following set of rules:

3.1 a). $\delta(q_0, 0) = (q_1, 1, R)$; $\delta(q_1, 1) = (q_0, 0, R)$; $\delta(q_1, B) = (q_f, B, R)$

3.2 b). $\delta(q_0, 0) = (q_0, B, R)$; $\delta(q_0, 1) = (q_1, B, R)$; $\delta(q_1, 1) = (q_1, B, R)$; $\delta(q_1, B) = (q_f, B, R)$

3.3 c). $\delta(q_0, 0) = (q_1, 1, R)$; $\delta(q_1, 1) = (q_2, 0, L)$; $\delta(q_2, 1) = (q_0, 1, R)$; $\delta(q_1, B) = (q_f, B, R)$

4 Problem 8.4.2

Here is the transition function of a nondeterministic $M = (\{q_0, q_1, q_2\}, \{0, 1\}, \{0, 1, B\}, \delta, q_0, b, \{q_2\})$: Show the ID's reachable from the initial ID if the input is:

δ	0	1	B
q_0	$\{(q_0, 1, R)\}$	$\{(q_1, 0, R)\}$	$\emptyset$
q_1	$\{(q_1, 0, R),\ (q_0, 0, L)\}$	$\{(q_1, 1, R),\ (q_0, 1, L)\}$	$\{(q_2, B, R)\}$
q_2	$\emptyset$	$\emptyset$	$\emptyset$

4.1 a). 01

4.2 b). 011