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Problem Set 6

These instructions below follow that of the textbook. I have attempted to organize the instructions in such a way that it might be easier to understand how the flow of the logic works. The diagrams are included at the end of the pdf.

A text file is included separately that formats the instructions below for the Turing Machine simulator.

24.)

(1, 1, 1, 1, R) (1, 0, 0, 1, R) (1, b, b, 2, L)

(2, 1, X, 3, L)

(3, 1, 1, 3, L)

(3, 0, 0, 3, L)

(3, b, b, 4, R)

(4, 0, 0, 4, R)

(4, 1, 0, 1, R)

(1, X, 1, 2, L)

25.)

(1, 1, X, 2, R)

(2, 1, 1, 3, R)

(3, 1, 1, 3, R)

(4, X, X, 4, R)

(5, b, b, 6, L)

(6, X, b, 6, L)

(6, b, b, 8, L)

(8, X, 1, 8, L)

(8, 1, 1, 8, L)

(3, b, b, 4, R)

(4, 1, X, 5, R)

(5, 1, 1, 7, L)

(7, 1, 1, 7, L)

(7, X, X, 7, L)

(7, b, b, 12, L)

(12, 1, 1, 12, L)

(12, X, X, 1, R)

(2, b, b, 9, R)

(9, 1, 1, 9, R)

(9, X, 1, 9, R)

(9, b, b, 10, L)

(10, 1, 1, 10, L)

(10, b, b, 11, L)

(11, X, b, 11, L)

28.)

(1, 0, 0, 1, R)

(1, 1, 1, 1, R)

(1, b, b, 2, L)

(2, 1, 0, 2, L)

(2, 0, 1, 3, L)

(2, b, 1, 3, L)

32.)

(1, 1, b, 2, R) //cell contains 1	(1, 0, b, 4, R) //cell contains 0
(2, 1, 1, 2, R)	(4, 1, 1, 4, R)
(2, 0, 0, 2, R)	(4, 0, 0, 4, R)
(2, b, b, 3, L)	(4, b, b, 5, L)
(3, 1, b, 6, L)	(5, 0, b, 6, L)

(6, 0, 0, 6, L)

(6, 1, 1, 6, L)

(6, b, b, 1, R)

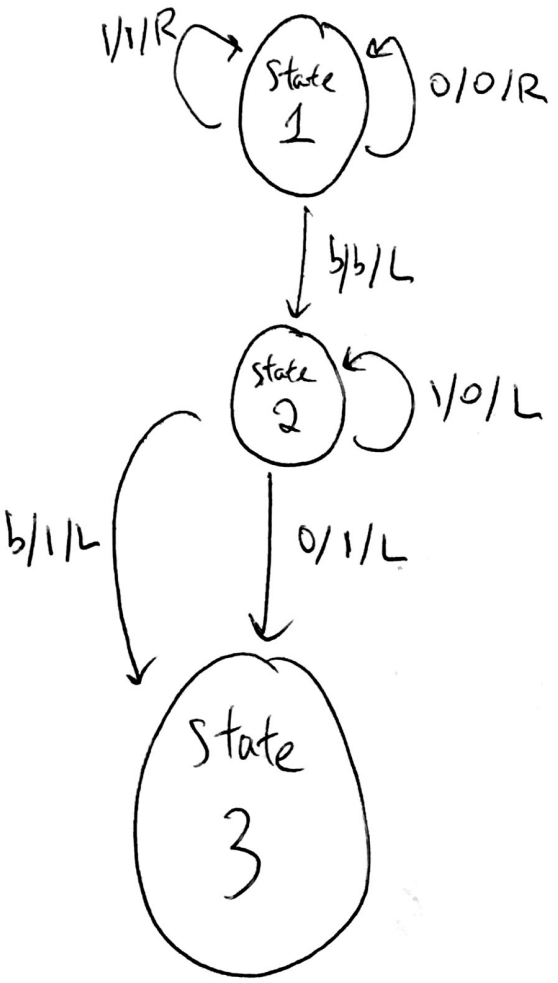
40.)

The 10-step halting problem is computable because unlike the chapter's previous examples of unsolvable problems, this problem is not suffering from generality. This problem has a specific and finite condition in which the Turning machine must halt within 10 steps, not any given number of steps. Therefore, it can be solved by running the Turning machine and seeing if it stops within 10 steps. If it does, then the problem is solved.

However, if it doesn't, it only means that the Turning machine does not halt within that specific number of steps. It does not mean it would never halt, given a greater number of steps.

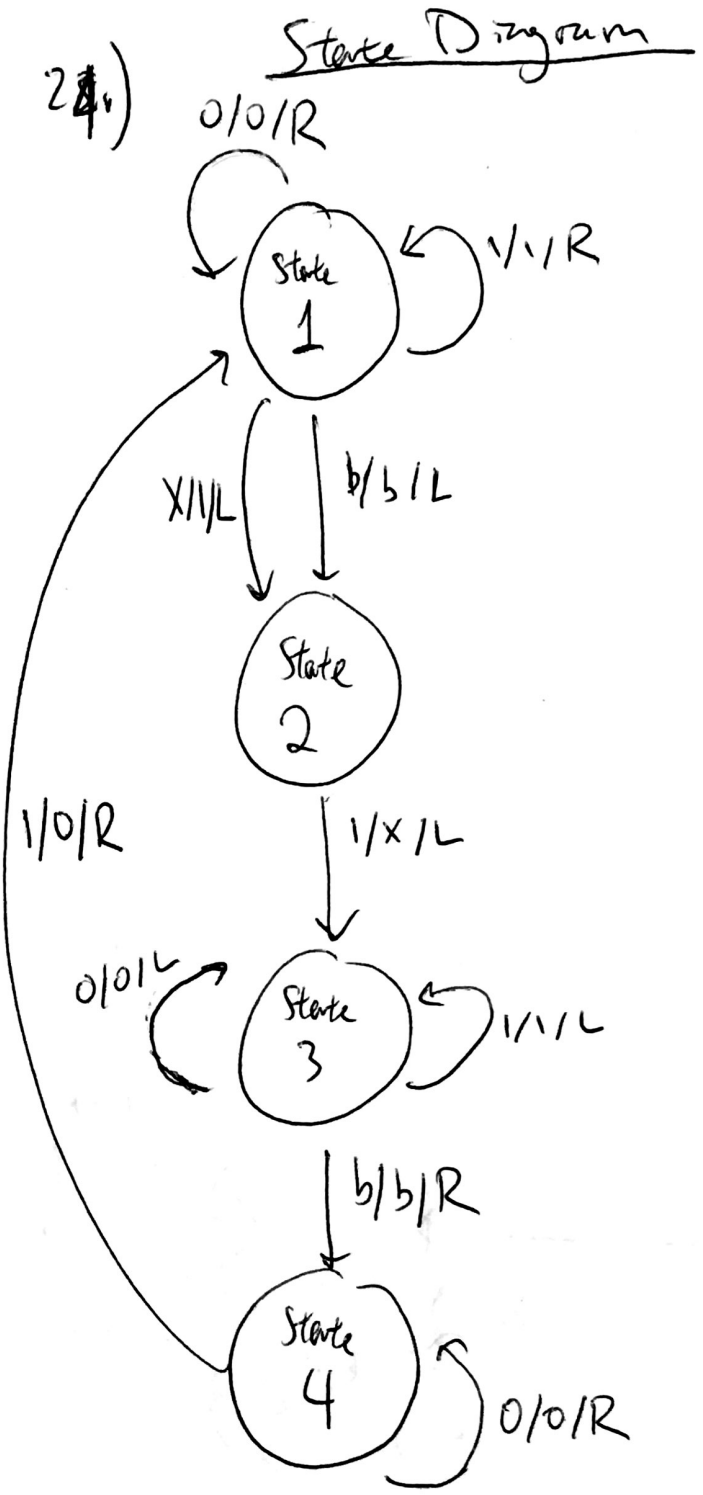
28.)

State Diagram

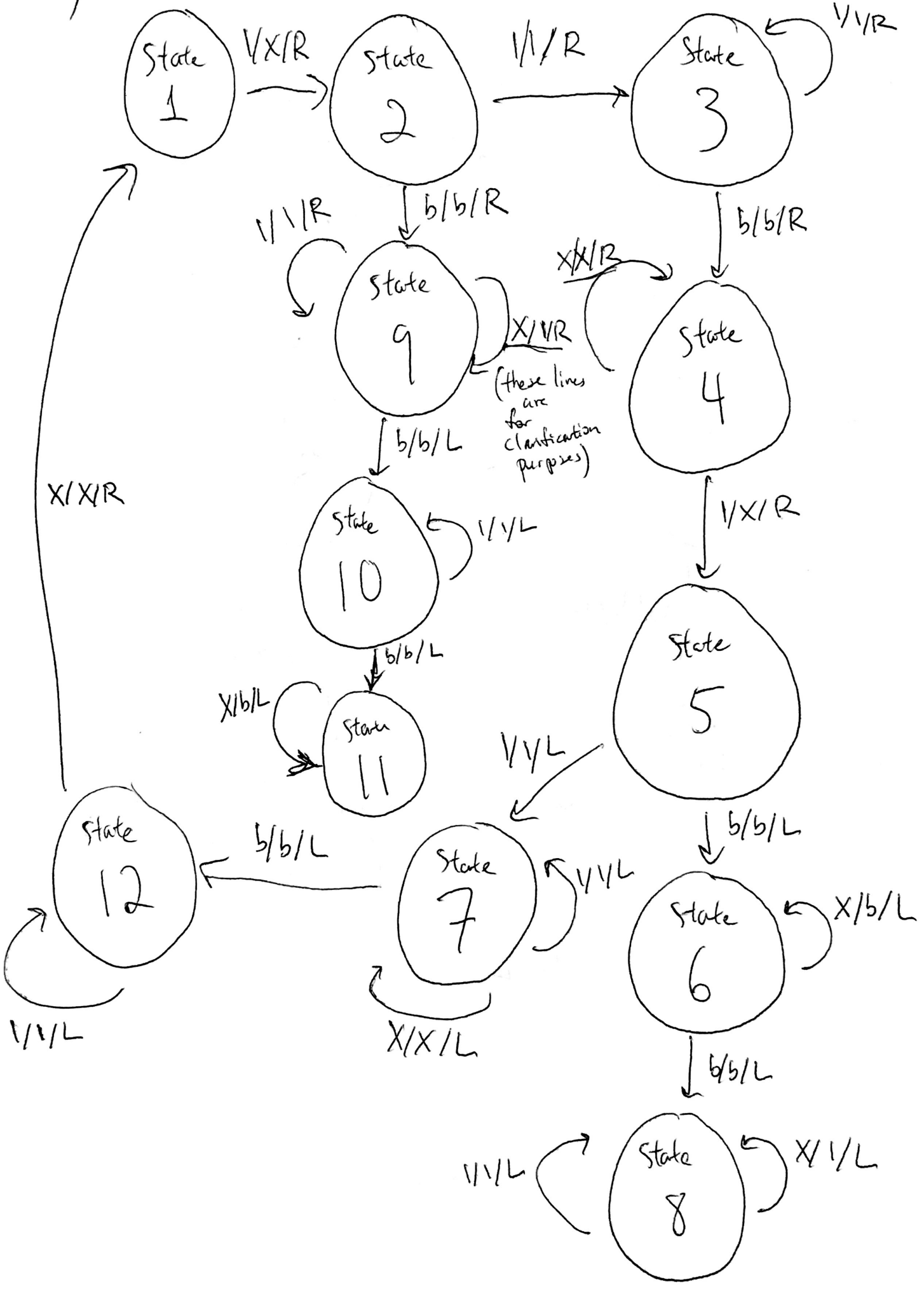


28.)

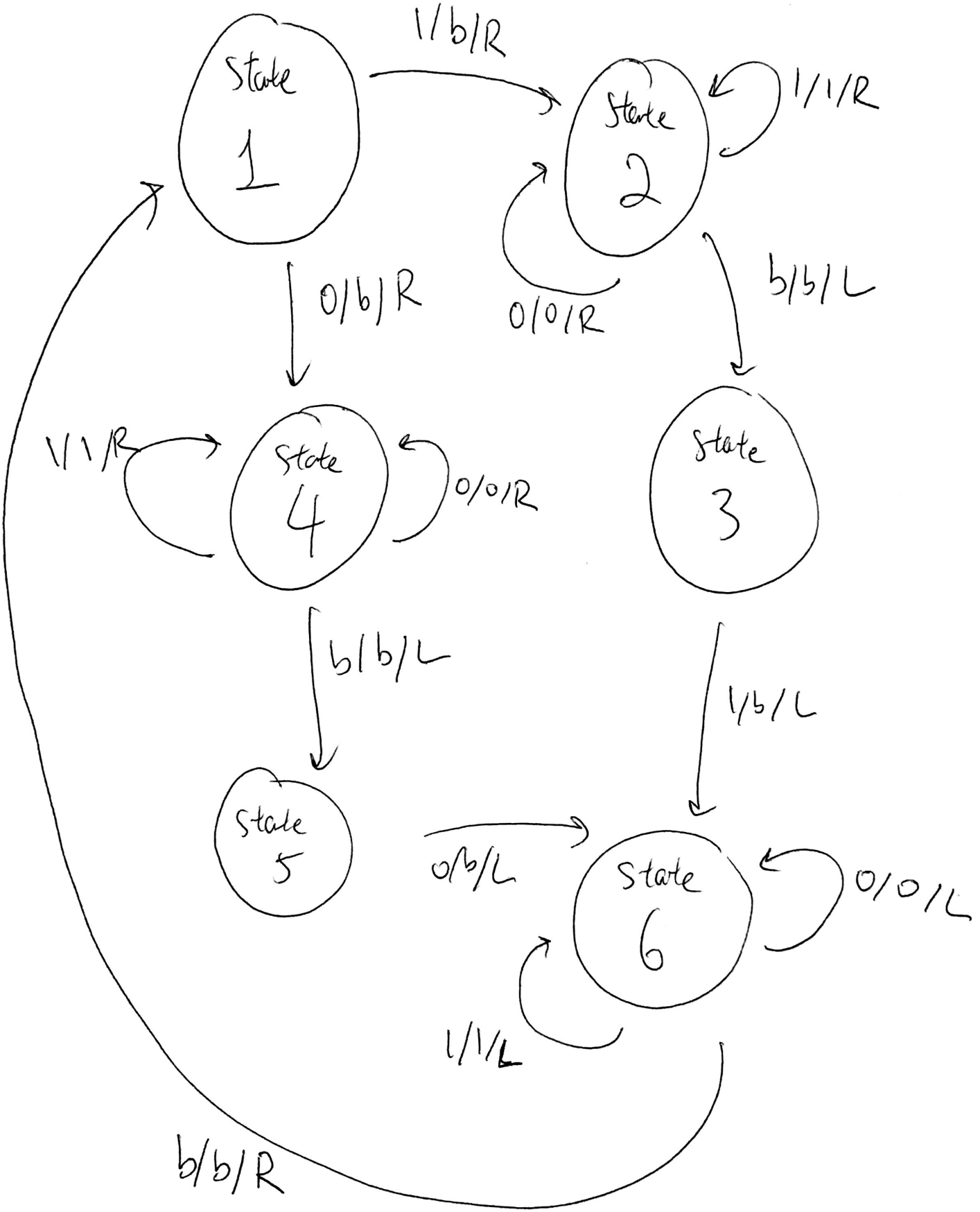
State Diagram



25.)


State 1
V/X/R
State 2
1/1/R
State 3
1/1/R
b/b/R
b/b/R
1/1/R
State 9
X/X/R
X/V/R
(these lines are for clarification purposes)
State 4
b/b/L
X/X/R
State 10
1/1/L
1/X/R
b/b/L
State 5
X/b/L
State 11
1/1/L
State 12
b/b/L
State 7
1/1/L
b/b/L
State 6
X/b/L
1/1/L
X/X/L
b/b/L
State 8
1/1/L
X/1/L

32.)


State 1
State 2
State 3
State 4
State 5
State 6
1/b/R
1/1/R
0/b/R
0/0/R
b/b/L
1/1/R
0/0/R
b/b/L
1/b/L
0/b/L
0/0/L
1/1/L
b/b/R