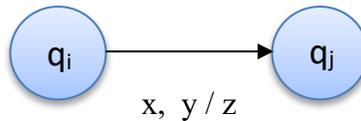


Choose any 2 of the 3 problems.

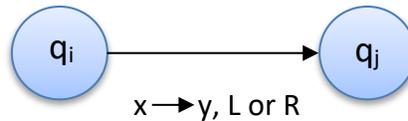
1. Consider language $L_1 = \{w : w \text{ does not contain the substring "ab"}\}$ over $\Sigma_1 = \{a, b\}$:
- (a). (10 pts) Draw the state diagram of an NFA for this language L_1 .
 - (b). (10 pts) Draw the state diagram of a DFA for this language L_1 .

2. Consider language $L_2 = \{w : w = xx^R\}$ over $\Sigma_2 = \{0, 1\}$, where “x” can be any string:
- (a). (10 pts) Draw a Pushdown Automaton to accept this language L_2 . You can use the following notation to label the transitions:



(read input symbol x , stack top is y , push symbol z)

- (b). (10 pts) Draw a Turing machine of any type to accept this language L_2 . You can use the following notation to label the transitions:



(read symbol x , write symbol y , direction to move is L or R)

- 3.
- (a). (5 pts) Give a definition of class NP.
 - (b). (15 pts) Show that class NP is closed under the concatenation operation.