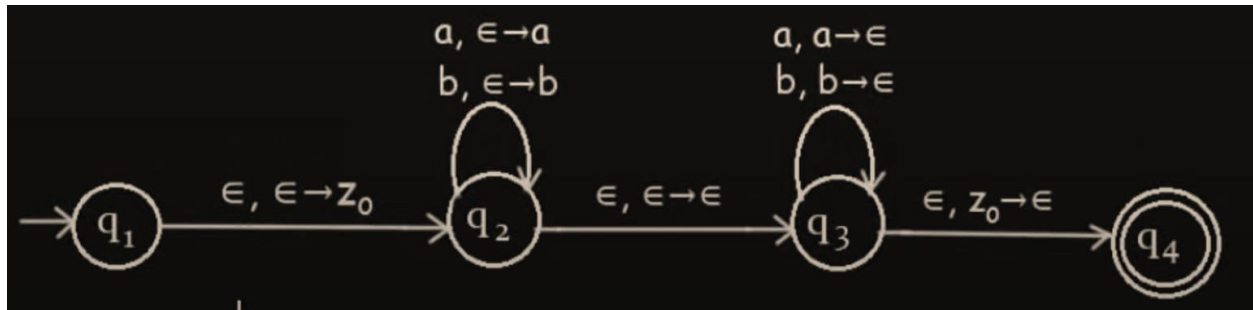Name: Malika Hafiza Pasha

Student ID: 212238171

Course: CSC 371 (Finite Automata)

Topic Name: Pushdown Automata (Even Palindrome)

Any input string that is an even-length palindrome of the form wwR, where w is a non-empty string of 'a's and 'b's, is accepted by this non-deterministic PDA. All potential matching combinations are checked by the non-deterministic loops of the non-deterministic.

Explanation of the four states:

No input symbol is read in the q1 state since it is '' and z0 (the topmost or first piece of the stack) is placed into the stack.

We get either input an or input b in the q2 state.

When input 'a' is given, nothing is removed from the stack and 'a' is instead pushed or added onto the stack.

For input "b," nothing is taken from the stack and "b" is pushed or inserted onto the stack instead.

Since the string's midway has been reached, neither a push nor a pop occurs, and we proceed immediately to the following state, q3.

We get either input an or input b in the q3 state.

In the case of input "a," "a" gets popped out of the stack and nothing is pushed onto the stack.

When input 'b' is used, nothing is added to the stack and 'b' is popped off of it.

Up till the string is finished, it is repeated.

No input symbol is read at the conclusion of the string, so we determine if zo is still the highest stack member.

The stack is empty and the string has reached its final state in the q4 state.

Example: Consider string 'abba'
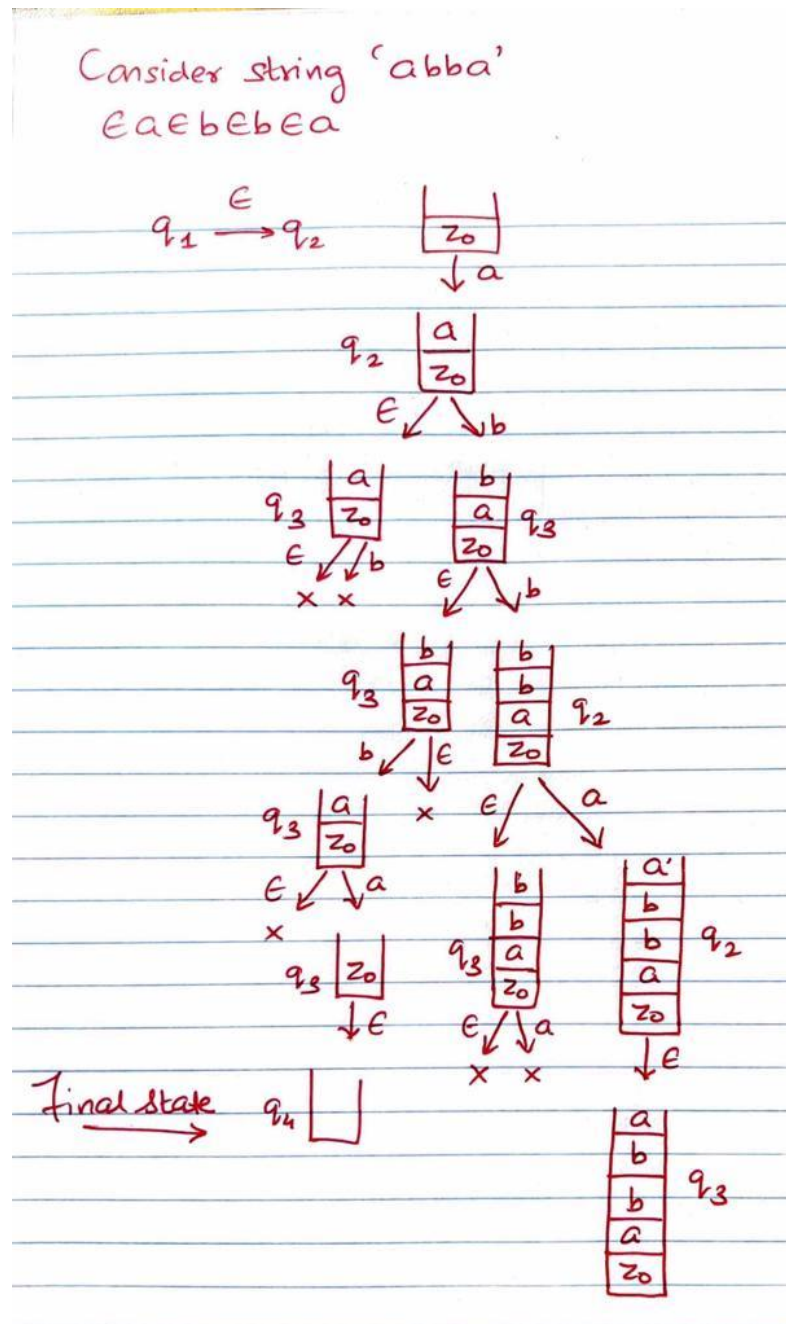
Example: Consider string 'abab'

Consider string 'abab'.

$\varepsilon a \varepsilon b \varepsilon a \varepsilon b$ ✗ This string is not accepted.

$q_1 \xrightarrow{\varepsilon} q_2$ | Z_0 |

↓ a

q_2 | a |
      | Z_0 |

$\varepsilon \swarrow$ $\searrow b$

q_3 | a | | b |
      | Z_0 | | a | q_2
                   | Z_0 |

$\varepsilon \swarrow\swarrow b$ $\varepsilon \swarrow$ $\searrow a$
  ✗ ✗

q_3 | b | | a |
      | a | | b |
      | Z_0 | | a | q_2
                       | Z_0 |

$a \swarrow$ ↓ ε $\varepsilon \swarrow$ $\searrow b$
  ✗   ✗

q_3 | a | | b |
      | b | | a |
      | a | | b | q_2
      | Z_0 | | a |
                       | Z_0 |

$\varepsilon \swarrow$ ↓ b ↓ ε
  ✗   ✗

                       | b |
                       | a |
                       | b | q_3
                       | a |
                       | Z_0 |