L2.1 Pushdown Automata Example (Even Palindrome) PART-1

Construct a PDA that accepts Even Palindromes of the form

$$L = \{\ ww^R \mid w = (a+b)^+ \}$$

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PALINDROMES: A word or sequence that reads the same backwards as forwards.
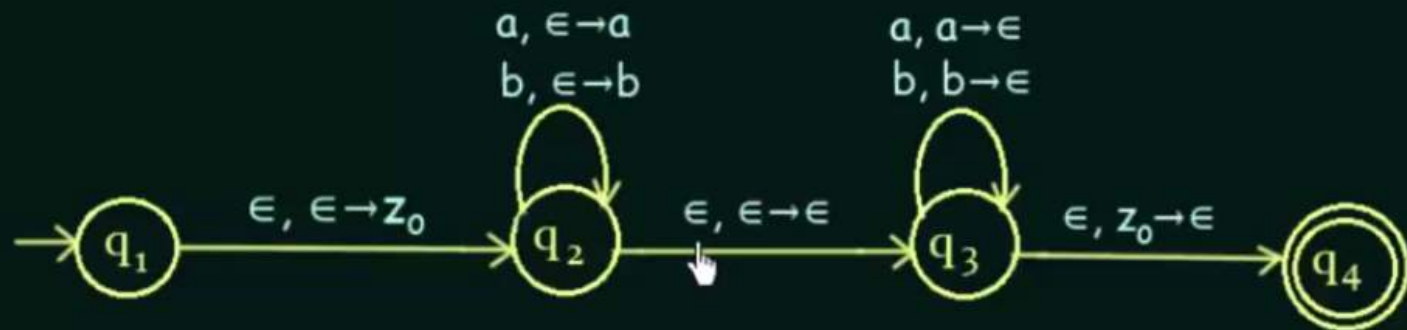
Examples: NOON
NO LEMON NO MELON
123321
abba
RACECAR

Pushdown Automata - Example (Even Palindrome) PART-1

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Transitions shown in diagram:

Self-loop on q_2: $a, \epsilon \rightarrow a$; $b, \epsilon \rightarrow b$

Self-loop on q_3: $a, a \rightarrow \epsilon$; $b, b \rightarrow \epsilon$

$q_1 \xrightarrow{\epsilon,\ \epsilon \rightarrow Z_0} q_2 \xrightarrow{\epsilon,\ \epsilon \rightarrow \epsilon} q_3 \xrightarrow{\epsilon,\ Z_0 \rightarrow \epsilon} q_4$

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$a\ bb\ a$

$a, \epsilon \rightarrow a$
$b, \epsilon \rightarrow b$

$a, a \rightarrow \epsilon$
$b, b \rightarrow \epsilon$

$$\rightarrow q_1 \xrightarrow{\epsilon,\ \epsilon \rightarrow Z_0} q_2 \xrightarrow{\epsilon,\ \epsilon \rightarrow \epsilon} q_3 \xrightarrow{\epsilon,\ Z_0 \rightarrow \epsilon} q_4$$

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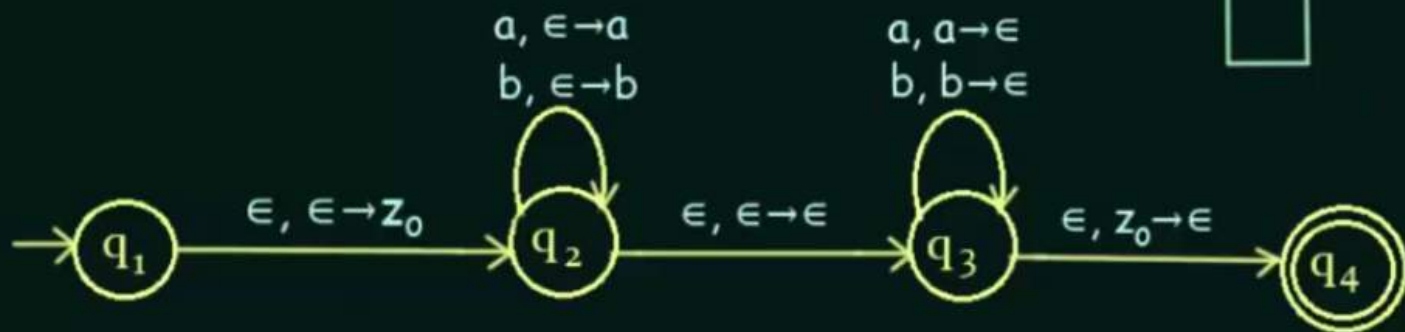PALINDROMES: A word or sequence that reads the same backwards as forwards.

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RACECAR

$a\,bb\,a$

Z_0

$a, \epsilon \to a$
$b, \epsilon \to b$

$a, a \to \epsilon$
$b, b \to \epsilon$

$\epsilon, \epsilon \to Z_0$ $\epsilon, \epsilon \to \epsilon$ $\epsilon, Z_0 \to \epsilon$

q_1 q_2 q_3 q_4

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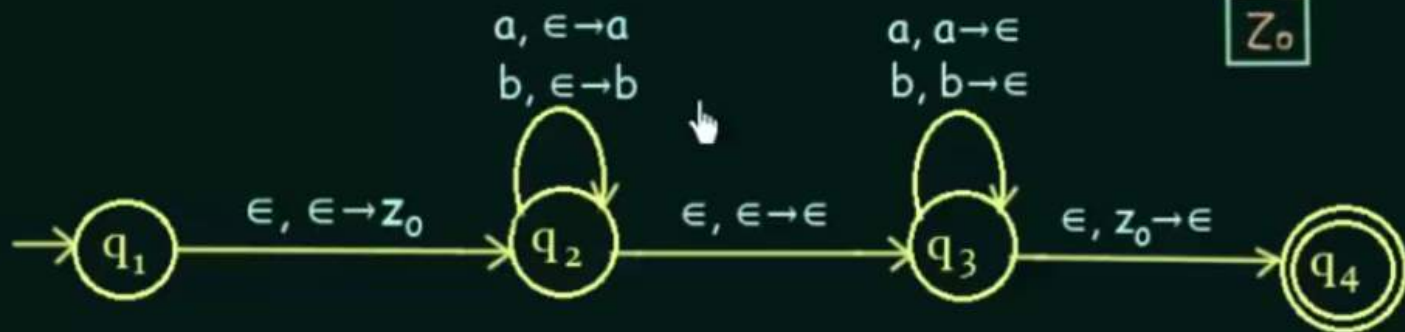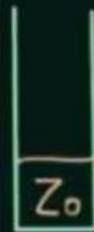
        Examples: NOON

                NO LEMON NO MELON

                123321

                abba

                RACECAR

$\underline{a}\,b\,b\,a$

a
Z_0

Transitions:

- q_2 self-loop: $a, \epsilon \rightarrow a$; $b, \epsilon \rightarrow b$
- q_3 self-loop: $a, a \rightarrow \epsilon$; $b, b \rightarrow \epsilon$
- $q_1 \xrightarrow{\epsilon, \epsilon \rightarrow Z_0} q_2$
- $q_2 \xrightarrow{\epsilon, \epsilon \rightarrow \epsilon} q_3$
- $q_3 \xrightarrow{\epsilon, Z_0 \rightarrow \epsilon} q_4$

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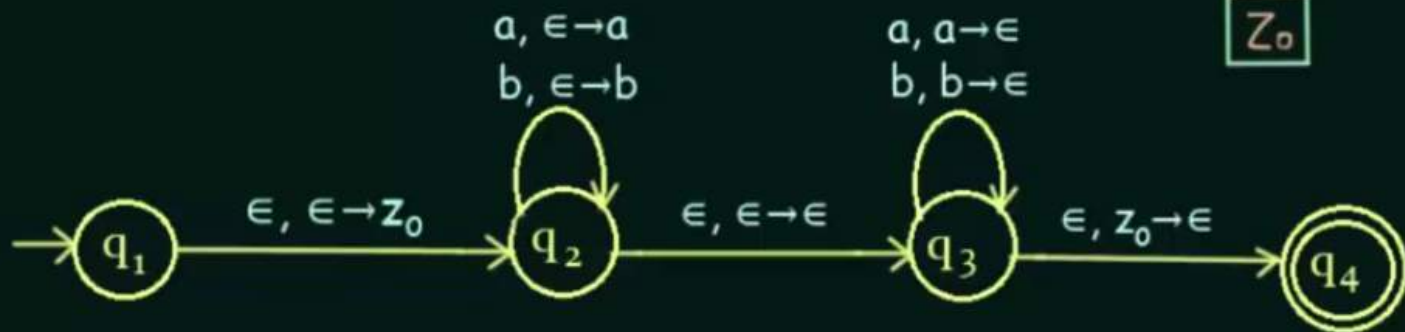PALINDROMES: A word or sequence that reads the same backwards as forwards.
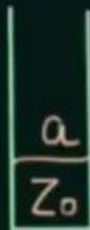
Examples: NOON

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$\underline{a}\,\underline{b}b\,a$

b
a
Z_0

$a, \epsilon \rightarrow a$
$b, \epsilon \rightarrow b$

$a, a \rightarrow \epsilon$
$b, b \rightarrow \epsilon$

$\epsilon, \epsilon \rightarrow Z_0$ $\epsilon, \epsilon \rightarrow \epsilon$ $\epsilon, Z_0 \rightarrow \epsilon$

$q_1 \quad q_2 \quad q_3 \quad q_4$

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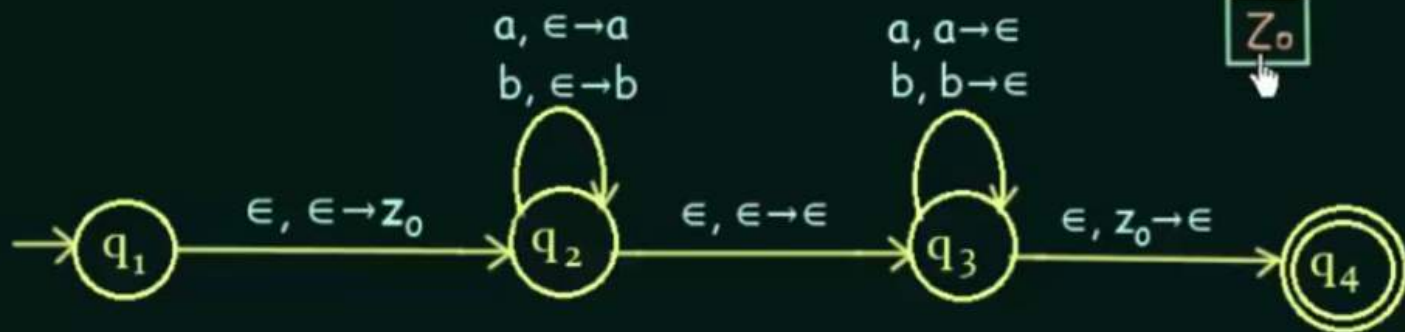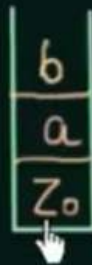
Examples: NOON

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$\underline{a}\ \underline{b}|\underline{b}\ \underline{a}$

b
a
Z_0

$a, \epsilon \rightarrow a$
$b, \epsilon \rightarrow b$

$a, a \rightarrow \epsilon$
$b, b \rightarrow \epsilon$

$\rightarrow (q_1) \xrightarrow{\epsilon,\ \epsilon \rightarrow Z_0} (q_2) \xrightarrow{\epsilon,\ \epsilon \rightarrow \epsilon} (q_3) \xrightarrow{\epsilon,\ Z_0 \rightarrow \epsilon} ((q_4))$

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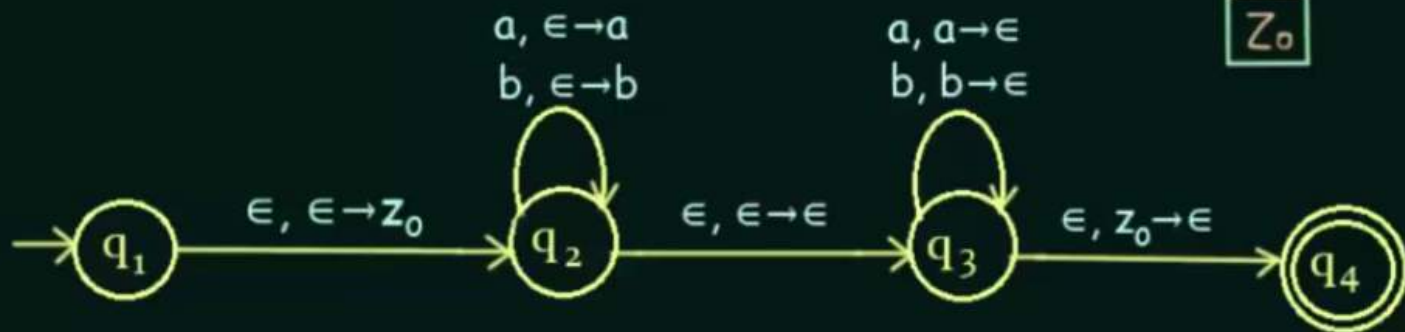
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RACECAR

$a\ b\ b\ a$

Z_0

$a, \epsilon \rightarrow a$
$b, \epsilon \rightarrow b$

$a, a \rightarrow \epsilon$
$b, b \rightarrow \epsilon$

q_1 $\epsilon, \epsilon \rightarrow Z_0$ q_2 $\epsilon, \epsilon \rightarrow \epsilon$ q_3 $\epsilon, Z_0 \rightarrow \epsilon$ q_4

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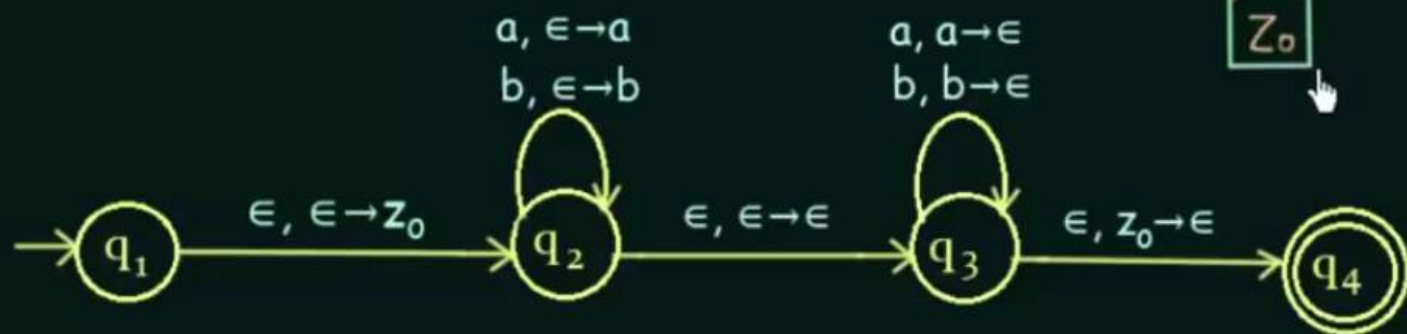
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$\underline{a}\ \underline{b}|\underline{b}\ \underline{a}\ \checkmark$ $\underline{a}\underline{b}|\underline{a}b\ \times$

$a, \epsilon \rightarrow a$
$b, \epsilon \rightarrow b$

$a, a \rightarrow \epsilon$
$b, b \rightarrow \epsilon$

$\epsilon, \epsilon \rightarrow Z_0$ $\epsilon, \epsilon \rightarrow \epsilon$ $\epsilon, Z_0 \rightarrow \epsilon$

q_1 q_2 q_3 q_4