MATH321 - Assignment-II

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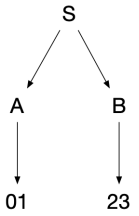
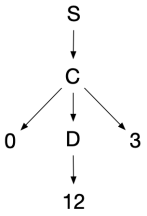
1 Q1

1.1 Q1-a



(a) Path 1



(b) Path 2

1.2 Q1-b

S $\to$ aABA | aB
A $\to$ bA | b | ε
B $\to$ cB | c | ε

$S_0 \to$ S
S $\to$ aABA | aB
A $\to$ bA | b | ε
B $\to$ cB | c | ε

$S_0 \to$ S
S $\to$ aABA | aB | aAA | a
A $\to$ bA | b | ε
B $\to$ cB | c

$S_0 \to$ S
S $\to$ aABA | aB | aAA | a | aAB | aBA | aA
A $\to$ bA | b
B $\to$ cB | c

$S_0 \to$ S
S $\to$ A_0ABA | A_0B | A_0AA | a | A_0AB | A_0BA | A_0A
A $\to$ B_0A | b
B $\to$ C_0B | c
$A_0 \to$ a
$B_0 \to$ b
$C_0 \to$ c

$S_0 \to$ $A_{0A}B_A$ | A_0B | A_0A_A | a | A_0A_B | A_0B_A | A_0A
A $\to$ B_0A | b
B $\to$ C_0B | c
$A_0 \to$ a
$B_0 \to$ b
$C_0 \to$ c
$A_A \to$ AA
$A_B \to$ AB
$B_A \to$ BA
$A_{0A} \to A_0A$

1.3 Q1-c

There must be equal number of 0's and 1's in the string. $L = \{w \mid w = (01)^* \cup (10)^*\}$

2 Q2

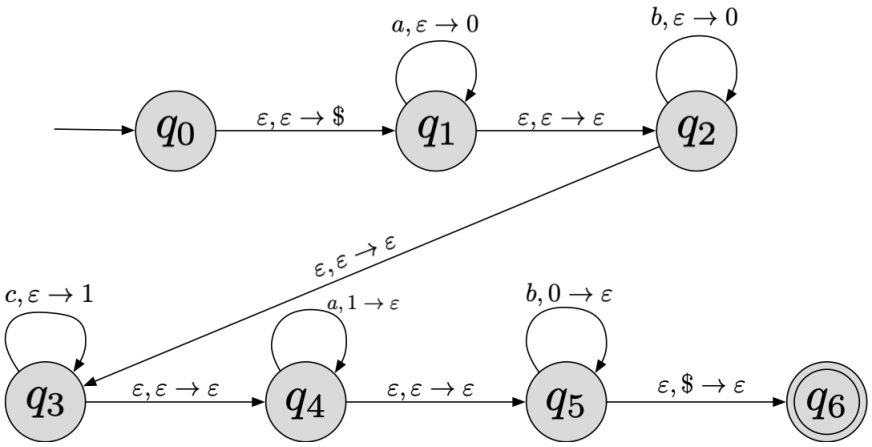
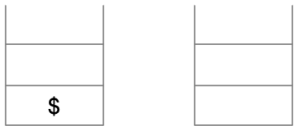


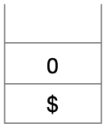
Figure 2: Push-Down Automata M

String accepted by PDA: ε String doesn't accepted by PDA: a



(a) Initial

(b) Final



(c) Initial & Final

3 Q3

Assume $a = b$, and pumping length $p = a = b$, then our string will be $x^{p^2} y^{p+1} x^{p+1}$
Break the string into **uvxyz** where, $|$ **vxy** $| \leq p$ and **vy** $\neq \varepsilon$

- **Case-I**: vxy contains only first sequence of x's;
  the string uv^0xy^0z will contain much less number of x than x^{p^2}
- **Case-II**: vxy contains both y and x;
  the string uv^2xy^2z may satisfy the number of x or y's but the it is out of order. Consequently, not belong to the language.
- **Case-III**: vxy contains only y;
  the string uv^2xy^2z can not contain same number of y's and trailing x's.
- **Case-IV**: vxy contains both y's and later sequence of x's;
  the string uv^2xy^2z may satisfy the number of y and x's but the it is out of order
- **Case-V**: vxy contains only later sequence of x's;
  the string uv^2xy^2z can not contain same number of x's and preceeding y's.