

BRAC UNIVERSITY
CSE331 : Automata and Computability
Summer 2025

Duration: 30 minutes

Quiz 4

Total: 20 marks

Name:	ID:	0.5 Points
Section:		0.5 Points

Ambiguity

Consider the following Context-Free Grammar, **G**:

$$\begin{aligned} A &\rightarrow 0B \mid 1A \mid 1C \mid \epsilon \\ B &\rightarrow 0A \mid 1B \\ C &\rightarrow 0C0 \mid 1C1 \mid \epsilon \end{aligned}$$

- a. Write a leftmost derivation for the string 10011 using **G**. (2 points)

Answer: $A \Rightarrow 1A \Rightarrow 10B \Rightarrow 100A \Rightarrow 1001A \Rightarrow 10011A \Rightarrow 10011$

- b. Show that **G** is ambiguous by writing another leftmost derivation of the given string. (2 points)

Answer: $A \Rightarrow 1A \Rightarrow 10B \Rightarrow 100A \Rightarrow 1001A \Rightarrow 10011C \Rightarrow 10011$

- c. Write a three-letter string that has only one parse tree using **G**. (1 point)

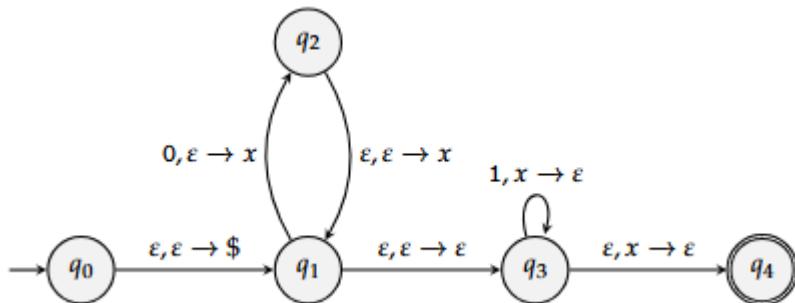
Answer: 010

PDA

1. Draw the state diagram of a PDA for the following CFL: (6 points)

$L(M) \rightarrow \{w = 0^n 1^m \mid n, m \geq 0 \text{ and } 2n > m\}, \text{ where } \Sigma = \{0, 1\}$

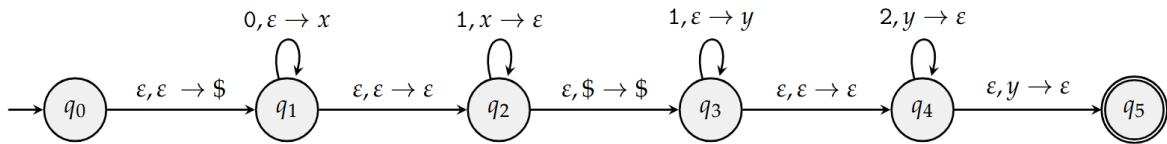
Solution:



2. Draw the state diagram of a PDA for the following CFL: (8 points)

$$L(M) \rightarrow \{w = 0^i 1^j 2^k \mid i, j, k \geq 0 \text{ and } j > i + k\}, \text{ where } \Sigma = \{0, 1, 2\}$$

Solution:



Bonus

1. Draw the state diagram of a PDA for the following CFL: (2 points)

$$L(M) \rightarrow \{w = 0^n 1^m \mid n, m \geq 0 \text{ and } m \leq n \leq 2m\}, \text{ where } \Sigma = \{0, 1\}$$

Solution: