**CSCE 5400 Formal Languages, Automata, and Computability - Fall 2024**

**Name:** Kishan Kumar Zalavadia

**EUID:** 11685261

**Assignment-3**

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**Ans:**



S 🡪 aSc | B

B 🡪 aBb | epsilon

S 🡪 abScd | abcd

S 🡪 AbBB

A 🡪 aA | bA | epsilon

B 🡪 a | b

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**Ans:** This grammar can generate any combination of 0 and 1 including epsilon.

L(G) = {0,1}\*

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**Ans:** S 🡪 aB | aaB | a | aa

B 🡪 aa

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**Ans:**

Remove epsilon productions:

A 🡪 BAB | B | BB | AB | BA | A | epsilon

B 🡪 00

Remove unit productions

A 🡪 BAB | 00 | BB | AB | BA | epsilon

B 🡪 00

A 🡪 BAB | XX | BB | AB | BA | epsilon

B 🡪 XX

X 🡪 0

A 🡪 BY | XX | BB | AB | BA | epsilon

B 🡪 XX

X 🡪 0

Y 🡪 AB

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**Ans:**

**i.**

S 🡪 A | B

A 🡪 XY

X 🡪 aXb | ab

Y 🡪 cYd | cd

B 🡪 aBd | aKd

K 🡪 bKc | bc

**ii.**

S 🡪 A | B

A 🡪 XY

X 🡪 aXM | aM

Y 🡪 cYN | cN

B 🡪 aBN | aKN

K 🡪 bKO | bO

M 🡪 b

N 🡪 d

O 🡪 c

S 🡪 aXMY | aMY | aBN | aKN

A 🡪 aXMY | aMY

X 🡪 aXM | aM

Y 🡪 cYN | cN

B 🡪 aBN | aKN

K 🡪 bKO | bO

M 🡪 b

N 🡪 d

O 🡪 c

**iii.** Yes, the grammar for language L is ambiguous because we can derive a string by different ways.

Ex: String “abcd” can be derived in 2 ways.

Method 1: S 🡪 A 🡪 XY 🡪 Xcd 🡪 abcd

Method 2: S 🡪 B 🡪 aKd 🡪 abcd