HOMEWORK 2

NAME: ANIL ICEN

NO: 2448488

QUESTION 1)

a)

G1 = {V_1, Σ_1, R_1, S_1} where V_1 = {b,a, S_1}, Σ_1 = {a,b}, and

R_1 = {S_1 --> S_1 a S_1 b S_1 b S_1 | S_1 b S_1 a S_1 b S_1 | S_1 b S_1 b S_1 a S_1 | e}

b)

G2 = {V_2, Σ_2, R_2, S_2} where V_2 = {b,a, S_2, X, Y}, Σ_2 = {a,b}, and

R_2 = {S_2 --> X | Y

X --> XaXaXbX |XaXbXaX | XbXaXaX| Y

Y --> YaYbY | YbYaY | e}

c)

Let G1 = (V, Σ, R, S) be a context-free grammar; we must construct a pushdown automaton M such that L(M) = L(G1).

Let M = (K, Σ, Γ, Δ, s, F), where

K = {q}

Σ = {a,b}

Γ = {A, a, b}

F = {q}

Δ = {((q,a,e),(q,A)),

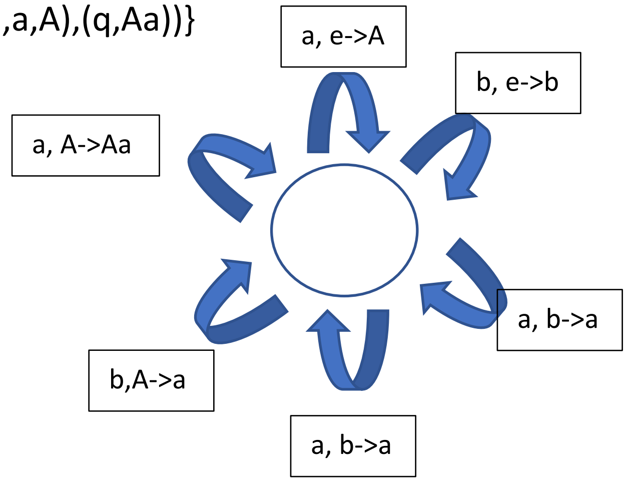
((q,b,e),(q,b)),

((q,a,b),(q,a)),

((q,b,A),(q,a)),

((q,b,a),(q,e)),

((q,a,A),(q,Aa))}



d)

In part a and b, we already defined G1 and G2 for L1 and L2.

Now we need to define a grammar for L3 = L1 U L2 and call that G3.

Using Theorem 3.5.1 from the book, we need to check whether that they have disjoint sets of nonterminals.

$V_1 - \Sigma_1$ = {S_1}

$V_2 - \Sigma_2$ = {S_2, X, Y}

We can clearly see that they are disjoint.

Then we will continue with creating the grammar.

V = V_1 U V_2 U {S} = {b,a, S_1, S_2, X, Y}

Σ = Σ_1 U Σ_2 = {b,a}

R = R_1 U R_2 U {S -->S_1, S --> S_2} = {S_1 --> S_1 a S_1 b S_1 b S_1 | S_1 b S_1 a S_1 b S_1 | S_1 b S_1 b S_1 a S_1 | e} U {S_2 --> X | Y

X --> XaXaXbX |XaXbXaX | XbXaXaX| Y

Y --> YaYbY | YbYaY | e}

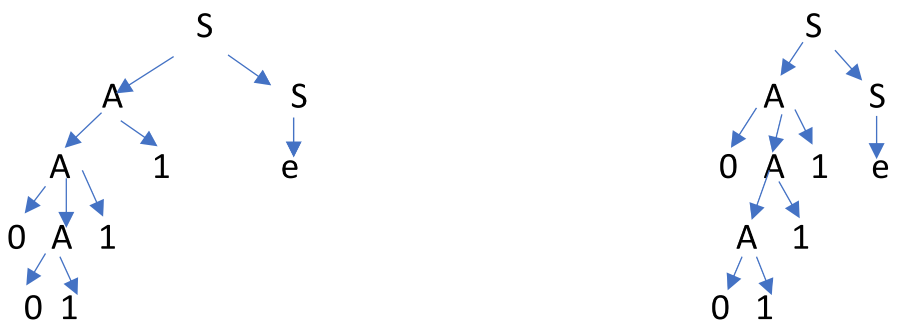
U {S -->S_1, S --> S_2}

Then our grammar becomes,

G3 = ($V_1 \cup V_2 \cup \{S\}$, $\Sigma_1 \cup \Sigma_2$, $R_1 \cup R_2 \cup \{S \dashrightarrow S_1, S \dashrightarrow S_2\}$)

QUESTION 2)

a)



There are two different parse trees. Therefore, this grammar is ambiguous.

b)

We need to create a unambigiuous grammar for the given grammar.

That is,

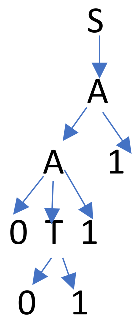
S -> A

A -> A1 | T | AA

T -> 0T1 | 01

c)

S => A => A1 => 0T11 => 00111


S
A
A
1
0
T
1
0
1