PAGE NO. :

FLAT TUT SHEET 2

ans 1) $L = \{ a^n b^m \mid m = n^2 \}$

Assume that the L is regular, then,

let $x = a^p b^{p^2}$ where P is Pumping Lemma and $p^2 > p = n$,

then, by Pumping lemma :

$x = uv^i w \in L$

here we get 3 cases :

case 1 :- V has only a, then

let $v = a^m$, where m is some integer, ~~then~~ such that $m < p$, then

$u = a^{p-m}$ $w = b^{p^2}$

$\Rightarrow |uv| = p-m+m = p \leq p$ ✓

$\Rightarrow$ ~~try~~ let $i = 2$, then

by Pumping lemma,

$x = uv^2 w$ must $\in L$

$= a^{p-m} \cdot a^{2m} \cdot b^{p^2}$

$= a^{p+m} \cdot b^{p^2}$

can

we, see that,

$(p+m)^2 \neq p^2$

$\Rightarrow x \notin L$

Case 2 :- V has only b, then

here ~~if~~ let $x = b^m$, where $m < p$, then

$|uv| = |a^p \cdot b^m| = p+m \nleq p$

$\Rightarrow$ this case is not possible according to pumping Lemma.

case 3 :- V has only ab, then

~~Then~~ here let $x = a^k b^z$ such that ~~k+z~~ $< p$

$|uv| = |a^p \cdot a^k \cdot b^z| = p+k+z \nleq p$

$\Rightarrow$ this case is not possible according to pumping Lemma.

$\Rightarrow$ there is a contradiction,

$\Rightarrow$ it is not a regular Language

Teacher's Signature

DATE: / /
PAGE NO.:

ans 2) For an $L = \{ (^n)^n \mid n \geq 0 \}$

assuming that x is regular language, then
$x = (^P)^P$ such that P is the pumping length, then
by Pumping Lemma,
$x = uv^iw$ must $\in L$, then two cases arise:

~~so~~ Case 1: x consists of $($, then
let $v = (^m$, when $m < P$, then
$u = (^{P-m}$ $w =)^P$
then $|uv| = |(^{P-m} (^m| = P \leq P$, so
let $i = 2$, then
$x = uv^2w$ must $\in L$, then

$x = uv^2w$
$= (^{P-m} (^{2m})^P = (^{P+m})^P \notin L$

Case 2: x consists $)$, then
let $v =)^m$ where $m < P$, then
$|uv| = |(^P)^m| = P+m \nleq P$
$\Rightarrow$ ~~it is not~~ this case is not possible.

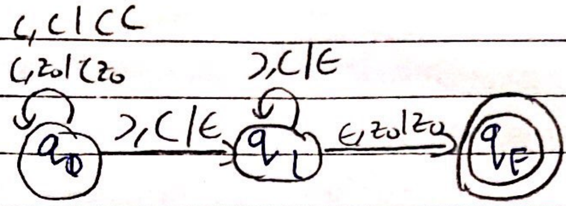
Case 3: x consists of $)($, then
let $v = (^k)^m$, when $m+k < P$, then
$|uv| = |(^P (^k)^m| = P+k+m \nleq P$
$\Rightarrow$ this case is not possible
$\Rightarrow$ there is a contradiction
$\Rightarrow$ our assumption is wrong,
hence given language is not regular language.

Teacher's Signature

Scanned with CamScanner

ans 4) given,

$L = \{ c^n)^n \mid n \geq 0 \}$



ans 5) It describes the language L, which can be defined as:
$L = \{ w ; \ n_a(w) \geq n_b(w)+1 \}$

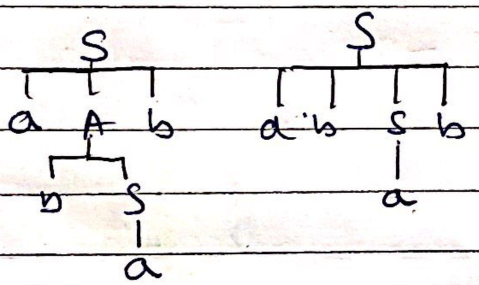
ans 7) given :-

$S \rightarrow a \mid abSb \mid aAb$

$A \rightarrow bS \mid aAAb$

$S \rightarrow abSb$, S → a, abab $S \rightarrow aAb$, A → bS, S → a

if we consider a string abab, Then
if we see the parse Tree for it :-



There are Two possible parse tree's
⇒ the given grammar is ambiguous

ans 8) given:-

$S \rightarrow aB \mid bA$

$A \rightarrow aS \mid bAA \mid a$

$B \rightarrow bS \mid aBB \mid b$

given strings :-
aaabbabbba

a) <u>The leftmost derivation:-</u>

$S \rightarrow aB$

$\rightarrow aaBB$

$\rightarrow aa(aBB)B$

$\rightarrow aaabbB$

Teacher's Signature

→ aaabbaBB

→ aaabbabbS

→ aaabbabbbA

→ aaabbabbba

b) The rightmost derivation:-

S → aB

→ aaBB

→ aa(aBB)B

→ aaa(aBB)(aBB)

→ aaa(aBB)aBbS

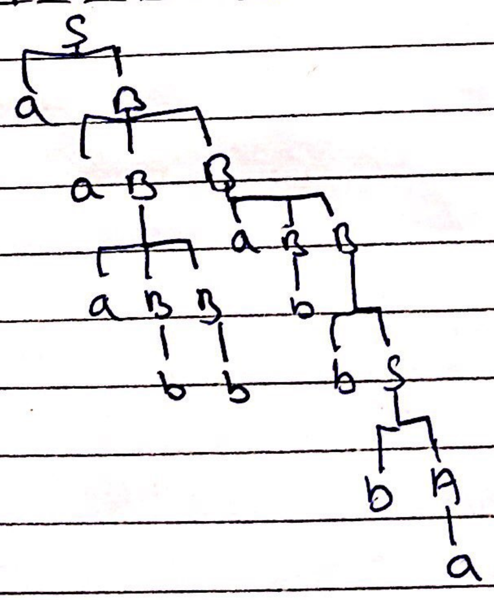
→ aaa(aBB)aBbbA

→ aaa(aBB)aBbba

→ aaa(aBB)abbba

→ aaaabbabbba

c) The parse Tree:-



ans 9) given:

$S \to 0S0 \mid 1S1 \mid A$

$A \to 2B3$

$B \to 2B3 \mid 3$

consider an example then:

0 S 0	0 S 0
1 S 1	0 S 0
A	A
2 B 3	2 B 3
2 B 3	3
3	
01223310	0023300

Basically we can see that the some part of the strings is palindrom (i.e the 01 part) and the middle part can be seen as $2^n 3^m$ when $n \geq m \geq 1$

⇒ The Language generated by this grammar is:

$$L = \{ w\, 2^n 3^m\, w^R \} \text{ where } w \in (0,1)^* \;\&\&\; n, m \geq 1 \}$$

Scanned with CamScanner