Aditya Kuti TE: IT-A ROLL No: 61

	Subject:- AT	Experiment / Tutorial / Assign/nent No. :	- 5 Page :-
? . ①	Reduce Grammar:		
	S-Y AB/CA		The second secon
	B-> BC/AB		·
	A-r a		
Į.	C + aB/b		
一	1 Production	of B doesn't	t have
	any termina	ed int it.	9.4 ûs
	producing	non-terminating	Strings.
	Hence, it	non-terminating drouble be	reduced.
	1 Any produc	ction rule i	n duding
	B Should	ction rule i	O
	: Reduced Gram	mar: S7 CA	
		A - r a	
		C 7 b	
- >	101		
.3)	CPG -> CNF		,
	S-7 bA /aB		
	A -> bAA /as		
	B -> aBB/b	S/a	
->	1) As there ar	e no useless	variables
	rull producti	ions & unit	productions,
	the guen	CF 4 ûs alre	ady reduced.
	(2) 180d.	New Prod.	*
	STDA	S → × A	
	0 , 0	X -> b	
	s - y a B	s -> YB	
	Δ 7 1- Λ Λ	y -> a	
	A -> bAA	$A \rightarrow \times U$	
		$\begin{array}{c} V \to AA \\ A \to YS \end{array}$	
-5	$A \rightarrow \alpha S$		

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	B-r aBB B-r yv V-r BB
	$B \rightarrow bS$ $B \rightarrow \chi S$
	Combining all the new prod. rules, we get $8 - 7 \times A / YB$
	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
·	Y -> a .: This is the CNF Form.
0.5)	Lets apply these rules one by one:
	(1) Start with E (2) 'a' is palindrone
	(3) assume × = 'b' .: axa will be a palindrome .: aba undeed is a palindrome
	arsume X = aba' axa -> abaabaaba should be a palindrome, which is true.
	Hence, & by following these orules palindrome can be defined.
۵-6)	$L = \{a^{n}b^{n-3} n > 3\}$ $L = \{a^{3}b^{0}, a^{4}b^{1}, a^{5}b^{2}, a^{5}b$
	S-7 aaa X
	x -> axb / E

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(8.0	CFG -> CNF		
- 3/	S -> aSaA /A		
	A -> ab A / b		
->		Prod.	
	S+A S+abA		
	8 → b		
	.: Reduced Form:	S-> asaA /abA	/ b
		A + ab A /b	
	2 Prod.	New	Prod.
	S-> aSaA	S -> XSXA	S -> PQ
		× → a	P→ XS
			$Q \rightarrow XA$
	S-> ab A	S -> × YA	S -> ZA
	A	У->b	$Z \rightarrow XY$
	A -y abA	A -7 ZA	
A	Consideration	2 2 2	- Q-
	Combining these the CNF to	new rules, we	get
	S-7 PQ/Z		
	A -> ZA/k		
	P -> XS		
	0 -> XA		
	X -> a		
	y → b		
	Z -> XY		i
71.			

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6.12)	Let L=f aab	, aaaabb, aaaa	aabbb 3		
		,			
	· S -> aasl	0/8	1		
0.13)		contain 3 4			
	.'. L = (b, b)	b, ba, bab, b	abb bbabb]		
	· S -> b / bb	150 100 100	Iala / C		
	. , 3 , 0 / 88	/ Sa / Sab / Sal	00 / 2		
(21.0	CFG -> CINF				
	S-> AB				
	A -> BSB / BB / b				
	$B \rightarrow aAb/a$				
\rightarrow	1) The given	cfa is a	bready in		
	its suduce	of form.			
		convert ut	Prod.		
	Prod.	10000	1400.		
	S-y AB	_			
	A -> BSB	A-YXB	_		
		X -> BS	-		
	B -> a Ab	B-y YAZ	B-7 PZ		
		y-ra	P-> YA		
		2-16	_		
	The CNF form is:				
	$S \rightarrow AB$ $A \rightarrow XB/BB/b$				
	$B \rightarrow PZ/a$				
	$\times \rightarrow BS \qquad P \rightarrow YA$				
	y -> a	, , , , ,			

(3) Now CNF should be converted to CINF. Pred. New Prod. X -> BS X -> PZS X -> aS X -> yAZS X -> aAZS P -> yA P -> aA B -> PZ B -> aAZ A -> xB A -> aAZSB A -> aAZB A -> aB S -> aAZBB S -> aSBB B S -> aAZBB S -> aBB S -> aAZBB S -> aBB S -> aAZBB S -> aBB The CINF Form is: S -> aAZSBB/aSBB/aSBB/aBB/aBB/bB A -> aAZBB/aSBB/aSBB/aBB/aBB/bB B -> aAZ X -> aAZSBB/aSB/aSB/aBB/aBB/bB B -> aAZBB/aSB/aSB/aBB/aBB/bB B -> aAZBB/aSB/aBB/aBB/aBB/bB B -> aAZBB/aSB/aBB/aBB/aBB/bB B -> aAZBB/aSB/aBB/aBB/aBB/aBB/bB B -> aAZBB/aBB/aBB/aBB/aBB/aBB/aBB/bB B -> aAZBB/aBB/aBB/aBB/aBB/aBB/aBB/aBB/aBB/aBB/		Subject:- A T	Experiment / Tutorial / Assignment No	o.:- 5 Page:- 5
Prod: New Prod: X -> BS X -> PZS X -> AS X -> YAZS X -> AAZS P -> YA P -> AA B -> PZ B -> AAZ A -> XB A -> AB A -> ABB A -				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		'		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Prod.	New	13DQ.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		X -> BS	X -> PZS	X -> aS
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$,		
B - PZ B - aAZ A - XB A - aAZSB A - aAZB A - BB A - aSB A - aB B S - AB S - aAZBB S - aSBB S - aAZBB S - aBB S - aAZBB S - aBB The CINF Form io: S - aAZSBB/aSBB/aSBB/aBB/BB A - aAZSB/aSB/aAZB/aB/b B - aAZ/a X - aAZS/aS Y - a Z - b P - aA Derivation tree for "aabbaa" S - aAS S - aAS S - a(SbA)(a) S - aabbaa			X -> aAZS	
A -> XB A -> aAZSB A -> aAZB A -> BB A -> aSB A -> aB BS -> AB S -> aAZSBB S -> aSBB S -> aAZSBB S -> aBB S -> aAZSBB S -> aBB S -> bB The CINF Form io: S -> aAZSBB/aSBB/aBB/aBB/bB A -> aAZSB/aSBB/aAZB/aB/b B -> aAZ/a X -> aAZS/aS Y -> a Z -> b P -> aA Derivation tree for "aabbaa" S -> a(SbA)(a) S -> a(a)b(ba)a S -> aabbaa		P -> YA	PinA	
A \rightarrow BB A \rightarrow aSB A \rightarrow aB BS \rightarrow AB S \rightarrow aAZSBB S \rightarrow aSBB S \rightarrow aAZBB S \rightarrow aBB The CNF Form is: S \rightarrow aAZSBB/aSBB/aAZBB/aBB/bB A \rightarrow aAZSB/aSB/aSB/aAZB/aB/bB B \rightarrow aAZ/a X \rightarrow aAZS/aS Y \rightarrow a Z \rightarrow b P \rightarrow aA Derivation tree for "aabbaa" S \rightarrow a(SbA)(a) S \rightarrow a(a) b (ba) a S \rightarrow aabbaa		B -> PZ	B -> aAZ	
BS -> AB S -> aAZSBB S -> aSBB S -> aAZBB S -> aBB S -> bB The anf form is: S -> aAZSBB/aSBB/aAZBB/aBB/bB A -> aAZSBB/aSB/aAZB/aB/b B -> aAZ/a X -> aAZS/aS Y -> a Z -> b P -> aA Derivation tree for "aabbaa" S -> aAS S -> a(SbA)(a) S -> aabbaa		A -> XB	A -> aAZSB	A-raAZB
S -> aAZBB S -> aBB S -> bB The CINF FORM is: S -> aAZSBB/aSBB / aAZBB / aBB / bB A -> aAZSB / aSB / aAZB / aB / b B -> aAZ / a X -> aAZS / aS Y -> a Z -> b P -> aA Derivation tree for "cabbaa" S -> a(SbA)(a) S -> a(SbA)(a) S -> a(SbA)(a) S -> aabbaa		A -> BB	A -y asB	
The CINF Form is: $S \rightarrow aA7SBB/aSBB/aA2BB/aBB/bB$ $A \rightarrow aA7SB/aSB/aSB/aA2B/aBB/bB$ $B \rightarrow aA7/a$ $X \rightarrow aA7SA/aS$ $Y \rightarrow aA7SA/aS$ $Y \rightarrow aA7SA/aS$ $A \rightarrow SBA/SS/ba$ Derivation tree for "aabbaa" $S \rightarrow aAS$ $S \rightarrow aAS$ $S \rightarrow aAS$ $S \rightarrow a(SBA)(a)$ $S \rightarrow aABbaa$		BS -> AB	S - aAZSBB	S -> aSBB
The GNF Form is: $S \rightarrow aAZSBB/aSBB/aBB/aBB/bB$ $A \rightarrow aAZSB/aSB/aSB/aBB/aB/bB$ $B \rightarrow aAZ/a$ $X \rightarrow aAZS/aS$ $Y \rightarrow a$ $Z \rightarrow b$ $P \rightarrow aA$ Solver for "aabbaa" $\therefore S \rightarrow aAS$ $\therefore S \rightarrow a(SbA)(a)$ $\therefore S \rightarrow aabbaa$				S -> aBB
$S \rightarrow aAZSBB/aSB/aAZBJ/aBB/bB$ $A \rightarrow aAZSB/aSB/aAZBJ/aBJ/bB$ $B \rightarrow aAZJ/a$ $X \rightarrow aAZSJ/aS$ $Y \rightarrow a$ $Z \rightarrow b$ $P \rightarrow aA$ $A \rightarrow SbA/SS/ba$ Derivation tree for "aabbaa" $S \rightarrow aAS$ $S \rightarrow a(SbA)(a)$ $S \rightarrow a(a)b(ba)a$ $S \rightarrow aabbaa$			S -> bB	
$S \rightarrow aAZSBB/aSB/aAZBJ/aBB/bB$ $A \rightarrow aAZSB/aSB/aAZBJ/aBJ/bB$ $B \rightarrow aAZJ/a$ $X \rightarrow aAZSJ/aS$ $Y \rightarrow a$ $Z \rightarrow b$ $P \rightarrow aA$ $A \rightarrow SbA/SS/ba$ Derivation tree for "aabbaa" $S \rightarrow aAS$ $S \rightarrow a(SbA)(a)$ $S \rightarrow a(a)b(ba)a$ $S \rightarrow aabbaa$				
$A \rightarrow aAZSB/aSB/aAZB/aB/b$ $B \rightarrow aAZ/a$ $X \rightarrow aAZS/aS$ $Y \rightarrow a$ $Z \rightarrow b$ $P \rightarrow aA$ $A \rightarrow SbA/SS/ba$ Derivation tree for "aabbaa" $S \rightarrow aAS$ $S \rightarrow a(SbA)(a)$ $S \rightarrow a(a)b(ba)a$ $S \rightarrow aabbaa$				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		$S \rightarrow aAZS$	BB/aSBB/aAZB	BB/aBB/bB
$\begin{array}{c} \times \rightarrow aAZS/aS \\ Y \rightarrow a \\ Z \rightarrow b \\ P \rightarrow aA \\ \\ A \rightarrow SbA/SS/ba \\ Derivation tree for "cabbaa" \\ \therefore S \rightarrow aAS \\ \therefore S \rightarrow a(SbA)(a) \\ \therefore S \rightarrow a(a)b(ba)a \\ \therefore S \rightarrow aabbaa \\ \end{array}$			·	1 a B / b
$7 \rightarrow a$ $Z \rightarrow b$ $P \rightarrow aA$ 8.17) $S \rightarrow aAS / a$ $A \rightarrow SbA / SS / ba$ Derivation tree for "aabbaa" $\therefore S \rightarrow aAS$ $\therefore S \rightarrow a(SbA)(a)$ $\therefore S \rightarrow a(a)b(ba)a$ $\therefore S \rightarrow aabbaa$				
$Z \rightarrow b$ $P \rightarrow aA$ S.17) $S \rightarrow aAS / a$ $A \rightarrow SbA / SS / ba$ Derivation tree for "aabbaa" $\therefore S \rightarrow aAS$ $\therefore S \rightarrow a(SbA)(a)$ $\therefore S \rightarrow a(a)b(ba)a$ $\therefore S \rightarrow aabbaa$			-5 / as	
P \rightarrow aA 8.17) S \rightarrow aAS /a A \rightarrow SbA /SS /ba Derivation tree for "aabbaa" \therefore S \rightarrow aAS \therefore S \rightarrow a(SbA)(a) \therefore S \rightarrow a(a)b(ba)a \therefore S \rightarrow aabbaa				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				
A \rightarrow SbA / SS / ba Derivation tree for "aabbaa" $\therefore S \rightarrow aAS$ $\therefore S \rightarrow a(SbA)(a)$ $\therefore S \rightarrow a(a)b(ba)a$ $\therefore S \rightarrow aabbaa$				
A \rightarrow SbA / SS / ba Derivation tree for "aabbaa" $\therefore S \rightarrow aAS$ $\therefore S \rightarrow a(SbA)(a)$ $\therefore S \rightarrow a(a)b(ba)a$ $\therefore S \rightarrow aabbaa$	(71.0	S -> AAS /a		
Derivation tree for "aabbaa" .: S -> aAS .: S -> a(SbA)(a) .: S -> a(a)b(ba)a .: S -> aabbaa			/ba	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				ч
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				
-: 5 -7 a (a) b (ba) a -: 3 -7 a a b b a a		: S -> aAS		
.: 3-7 aabbaa		.: S → a (Sb	A)(a)	
		.: 5 - a (a)) b (ba) a	
		.: 3- aab	baa	
	-,			

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	Derivation Tree:			
	S			
	a A	5		
	SbA	a		
	a b	a		
16)				
-	x -> Xa/xb/E			
	LMD & RMD for "abaab ""			
	30 San 1 Marie			
	LMD:	RMD:		
	$S \rightarrow \alpha \times \times$	S -> aX		
	5 -> a (xb) b	$s \rightarrow a(xb)$		
	$S \rightarrow a(xa)bb$	$S \rightarrow a (xb)b$ $S \rightarrow a (xa)bb$		
	$S \rightarrow a(xa)abb$	5 -7 a (Xa) abb		
	s → a (xb)aabb	s -7 a (Xb) aabb		
	$S \rightarrow ababb$	S -> abaabb		
	3 , 30 1001 3)		
	AS Thomas was subst	one variable		
The state of the s	as there was only in the production	n rule that we		
	used, LMD & RM	D are same.		
1000	,			
1				
The state of the s				

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0.28)	$L = \int a^{n}b^{m+n}c^{2m} n > 0, m > 0 $ $L = \int ab^{2}c^{2}, a^{2}b^{3}c^{2}, a^{2}b^{4}c^{4}, a^{3}b^{5}c^{4}, $
	lets assume L is context-free language. For $S = ab^2c^2$ ($n=1$, $m=1$), assume $u = a$ v = b x = b
	$y = c$ $Z = c$ $S = uv'xy'Z \text{for } i > 0 \text{should be un } L.$ $S_1 = uv^2xy^2Z$
	$= abbbccc$ $= ab^{3}c^{3}$ $But, Si \neq a^{n}b^{m+n}c^{2m}$ $\therefore ab^{3}c^{3} \not\in L$
	.: According to pumping lamma L is not a conferct free language.

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0.29)	$L = \{a^n b^{2n} c^n \mid n > 1\}$
	$\therefore L = \{ab^2c, a^2b^4c^2, a^3b^6c^3, \dots \}$
	Lets assume L is a context-free
	language.
	For $S = a^2b^4c^2$ $(n=2)$
	assume u = a
	V = ab
	x = pp
	y = b c
	Z = C
	B. Commence of the commence of
	S= Winy'z should be in L. tor 9>0
	$S_1 = uv^2xy^2Z$
	= a (abab) bb (bcbc) c
	= aababbbcbcc
	$= \alpha^2 b a b^4 c b c^2$
	But, $S_1 \neq a^{\gamma}b^{2\gamma}c^{\gamma}$ $a^2bab^{\gamma}cbc^{2} \notin L$
	a baby cbc + L
	According to pumping lemma
	Luis not a context-free language.
	language.
	5 0