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8.2.	Express the below	cfg in CNF:	
	$S \rightarrow aB/bA$	to my grant poly	le l
	$A \rightarrow a/as/b$	AA	
	$B \rightarrow b/bSA$	/ aBBA.	
Soln:	<b>→</b>		0
	Step 1: No Null Unit	2 Useles Produc	otion tourid.
-	Grammar	is already simplifie	d. 416
War	Stepa:	I have	1 9 000
ta f	Production	Solution	a Contact Ra
	$A \rightarrow a$	A→a	<del></del>
5 15	- B → b	B→ b	· cidio 55
	A→ aS	$C_1 \rightarrow a$	
	$A \rightarrow c_1 S$	A→CIS	
	3→aB	S - C, B	,
	S→bA	$c_2 \rightarrow b$	
	= 1	S→ C2A	
	B→bSA	1 1	/ II
	B → G.SA	1	
	C <sub>3</sub> → SA	$C_3 \rightarrow SA$	Su Su
		B+603	, 2
	A→bAA		· ·
	$A \rightarrow c_2 AA$		1 1
5	$C_{\mathcal{H}} \rightarrow A A$	$C_4 \rightarrow AA$	`\
	A. 2 & /-	$C_4 \rightarrow AA$ $A \rightarrow C_5 C_4$	Λ
	B → aBBA		<u> </u>
	B > C, BBA		/ 1
100000	C6 > 488A		*/ i. /
	C5→ BBA		
	$C_6 \rightarrow BA$	B -> C1C5	
		C5 → BC6	li i
7-5 2 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		C <sub>6</sub> → BA	
12 344			

=		232.0 q @WS3000 DW3	ENGINEERING COLLEGE
		: CNF B	5 -1
		$B \rightarrow C_1 B / C_2 A$	T. E. S.
		$A \rightarrow \alpha / C_1 S / C_2 C_4$	. · A
		B + b / C2C3 / C1C5	
	-	$C_1 \rightarrow a$	in the state of the state of
1	· A	$C_2 \rightarrow b$	A 5-
	* *	$c_3 \rightarrow 3A$	tino a
		$C_4 \rightarrow AA$	r [ ] [ ] [
		C5 → BC5	Cart
	$\rightarrow$	CG -> BA.	Teach atis I have
		) for	
	Q:3.	Define:	v 1 0 squ' di
	-	13 CHOMMAN 3-13	
		- Gramman is used for 91	secifying the syntax
	SHORE	d a language & 18 define	1, as follows,
_		G = (V, T, P; s)	المعرب الم
		where.	b. La hais
		V= finite set of voxiables/	non-terminal.
,		T = finite set of terminals	
	T ,	P =finite set of production	n rules.
		S= Start Vaxiables	
-		will be sured in the second	TALK .
-		(ii) Context Free Grammar (CFG):-	1 6 1 1 0 0
	1.15.11.5	A Grammar is said to	be context fee Grammon
		(cFG) if all the productions	ite of the form
		$A \rightarrow \alpha$ where, $A \rightarrow Voxiable$	of a grant of the second of th
	2	where, A -> Vociable !	I la I D
3	<u> </u>	$2 \times 3 = 13 \text{ in some } 3$	sentential form.
		6 = (13, A3, 1a, b3, P,3)	tustion)
	- tari	and but a lock on his	Contract of the Contract of th
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	ρ:
	$g \rightarrow aSb/aA/a$
	$A \rightarrow Ab/b/e$
	(iii) Unit Production:
	-> A production of the form A+B where
	A and B are variables are called
¥	unit production.
	DE 15 15
Q.4.	Write Short Note on: Chomsky Hierarchy.
Solni	$\rightarrow$
	(i) Type O / Unxestricted Grammax:- In this grammar, there are no restrictions on
,	In this grammar, there are no restrictions on
The second	production rule eg: 8-rat, at + bBC, c-b, B-ra.
	Unxestricted grammar generates xecrosively Erumerable
	language & to recognize it turing machine can be
	constancted.
	(31) Type 1 / Context Sensitive Grammax:
1	To this grammar, there are two restaictions
	on production rule (i)   a   E   B
	(ii) Stat vaiable(3) cannot appear on R. H.S
	Eg:- B bB bB > CB B > Q.
arytemer i	It is called Context Sensitive because the replacement
	of capital it by is allowed only in the context
	(a) is preciding (A' & B' is surcewing (A')
	AT 9.
August Augus	QAB ⇒ ~ YB
	and to recognize it LBA (Linear Bounded Automata) can be constaucted.
	and to recognize it LIDA (Linear Hounded Awornata) can be constaucted.



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	(iii) Type 2/ Context free Gramman (CFG):
	In this grammar all moductions should be of the form
•	A -> a where, A is a variable & a is in some
	sentified from ea: 8 - a8b/bsb/a.
	CFG generates CFL & to recognize it FDM can be constanted,
	(iv) Tupe 3 / Repular Grammar (R.E):
,	It is a CFG with a xestauchort the sine know suc
	contain at the most voviable.
	If all the variable appear at the left most position then it
	is called Left Linear grammer.
	If all the variable appear at the right most position then It
	is called Right linear grammas.
	ea: R.I.G S-aB B-> CB/d.
	R.G. generates R.L and to recognize it finite automota can be
\	constanced in the constance of the const
	Recursively Context Free Bramman (CFG)
	Former the language (CFL)
	Language (REL) Type!  PDA
25 (1-2)	Tuxing M/c
	Type2
	Co Valida De Maria
	Type 3
	of spile to VI
(in	position of the
	Régular Grammar
Contest	
· · · · · · · · · · · · · · · · · · ·	Sensitive  Regular Language (RL)  (CSL)  Finite Automata.
Contrad	Servitive Language
LBA	A. A
1 2 - 1	

1	
0.5.	Design a PDA to xecognize the foll language:
(y.5.	$L = \left\{ \frac{a^{\eta}b^{\eta}}{n} \right\} \frac{1}{3}$
Q lat	
Soln;	Logic:
, h	Fox each 'a', Push one X on- the stack
Sen 55(1125)	For each 'b', pop one X from the stack.
2.1	In plementation:
1000	$M = (Q, \Xi, \Gamma, \lambda, q_0, Z_0, F)$
11	$0 \sim 5 a \cdot a \cdot a \cdot a \cdot b \cdot a \cdot a \cdot b \cdot a \cdot a \cdot$
1 12	$z = \{a,b\}, \Gamma = \{x,R\}$
	$q_0 = \{q_1 \}$ , $q_0 = \{R\}$ $F = \{q_1 \}$
* O O	to the state of th
7	3:
. 1	2/2 2) = /2 Ve) - First a Dugh
12.0	$\frac{\partial(q_1, a, x) - (q_1, xx) - Remaining a's}{\partial(q_1, a, x) = (q_1, xx) - Remaining a's}$
	$\partial(q_1, b, x) = (q_2, e) - Fixt b$ Por (9)
101	$\partial(q_1, b, x) = (q_2, \epsilon) - \text{Remaining bis}$
64	individual of the second of th
<i>A</i> .	$\partial(q_2, \xi, R) = (q_R, R) - Final - No operation (9)$
- X	Example:
	n=3
	eg: (1) (q, aoabbb, R)
_	+ (q, aabbb, XR)
	+(q1, abbb, XXR) ·
	- (q, bbb, XXXR)
T.E	10 00 00 10 10 (q2, bb, XXR)
i din sa	1 (q, b, XR)
	1. (q2, E, R)
	1- (9x, R)
	: Accept



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0.6.	What is Twing Machine? Explain the components, model and working of Twing Machine.
0.1	model and working of Twing Machine.
Soln:	> 0
	Troving machine (TM) is considered to be a simple model of a computer 2 is the most pivorful machine.  Twing machine can perform:
	model of a computer & is the most parooful machine.
	Twing machine can perform?
	(1) Language Recognition.
	(i) Language Recognition.  (ii) Evaluation of some function
	Model of TM:
	read/write
0.50	
	rinite state
:	Control
	Comments of TM: Turing and in society of Paris I
,·	Components of TM: Twing machine wonsists of finite set of states, input - output tape and and/write head.
	Sides, input out the tags will sign, water rise.
	Working of T.M:
	Depending upon the state & the tape symbol,
	(3) TM can change the state / remain in the same state.
76-	(ii) TM can change the tape symbol / keep it the same
1/-	(7ii) TM moves the head fleft, right, some?
	TM is mathematically represented by 7-tuple relation:
1	TM is mathematically represented by 7-tuple relation:
	where
	Q = finite set of states
th.	E= Input alphabet
\$	
8 - 1 II	



	d = Transition function
	$\partial = \text{Transition function}$ $\partial : Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R, S\}$
	90 = start/initial symbol go EQ
2	$q_0 = \frac{\text{start}}{\text{initial symbol}}, q_0 \in Q$ $B = \text{Symbol to sepresent blank } B \in \Gamma$ $F = \text{Finite set of final state}, F \in Q$
1.	F= Finite set of final state FEQ
3	
= -	
F P	