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Internal Assessment Test -DEC-2024

Sub:	**THEORY OF COMPUTATION**					Sub Code:	**BCS503**	Branch:	**ISE**
Date:	**17/12/2024**	Duration:	**90 min**	Max Marks:	**50**	Sem/Sec:	**V / A,B,C**		**OBE**

	Answer any FIVE FULL Questions	MARKS	CO	RBT
1	Illustrate the LMD and RMD and parse tree for the given grammar S→ aB|bA , A→ aS |bAA |a, B→bS|aBB|b for the string w= aaabbabbba.check whether the Grammar is ambiguous	[10]	CO3	L3
2	Construct the PDA to accept the Language L={WCW^R |w belongs to {a,b}*},show the instantaneous descriptors for the string aaCbb	[10]	CO3	L3
3	Define Chomskey Normal form (CNF) and Illustrate the CNF form for the given gramma S→ S+T |T/R , T→T*a |b , R→R* a	[10]	CO4	L3
4.	State and Prove pumping lemma for context free Languages, and prove that L={$a^nb^nc^n$ | n>=0 is not context free}	[10]	CO4	L2
5.	Explain Turing Machine, Construct the Turing machine to accept the language L ={a^nb^n }n >=1 } and accept the string aabb	[10]	CO5	L3
6.	Explain the Programming techniques and Extension to Turing machines	[10]	CO5	L2

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1	Illustrate the LMD and RMD and parse tree for the given grammar S→ aB|bA , A→ aS |bAA |a, B→bS|aBB|b for the string w= aaabbabbba.check whether the Grammar is ambiguous	[10]	CO3	L3
2	Construct the PDA to accept the Language L={WCW^R |w belongs to {0,1}*},show the instantaneous descriptors for the string 01C10	[10]	CO3	L3
3	Define Chomskey Normal form (CNF) and Illustrate the CNF form for the given gramma S→ S+T |T/R , T→T*a |b , R→R* a	[10]	CO4	L3
4.	State and Prove pumping lemma for context free Languages, and prove that L={$a^nb^nc^n$ | n>=0 is not context free}	[10]	CO4	L2
5.	Explain Turing Machine, Construct the Turing machine to accept the language L ={a^nb^n }n >=1 } and accept the string aabb	[10]	CO5	L3
6.	Explain the Programming techniques of Turing machines	[10]	CO5	L2

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Internal Assessment Test II– Dec-2024---Scheme

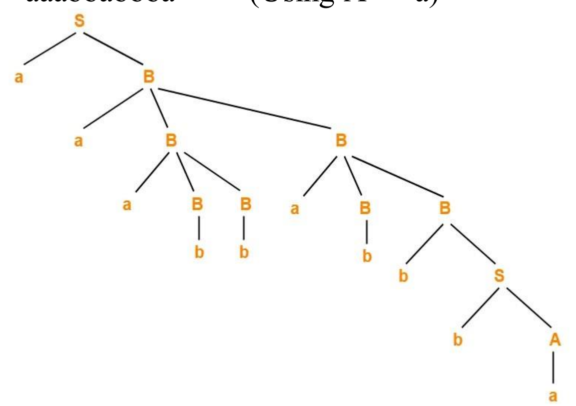
Sub :	**THEORY OF COMPUTATION**	Sub Code:	**BCS503**	Branch:	**ISE**

Date:	**/12/2024**	Duration:	**90 min**	Max Marks:	**50**	Sem/Sec:	**V A,B,C**	**OBE**

	<u>**Answer any FIVE FULL Questions**</u>	MARKS	CO	RBT
1	Illustrate the LMD and RMD and parse tree for the given grammar S→ aB|bA , A→ aS |bAA |a, B→bS|aBB|b for the string w= aaabbabbba.check whether the Grammar is ambiguous	[10]	CO3	L3

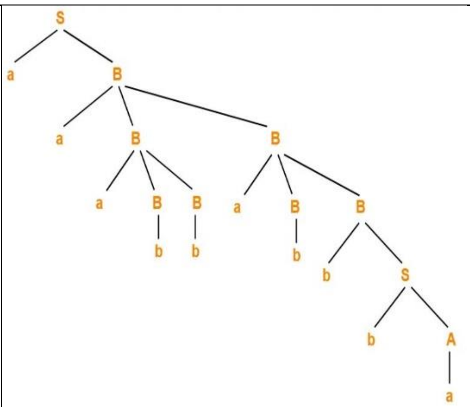
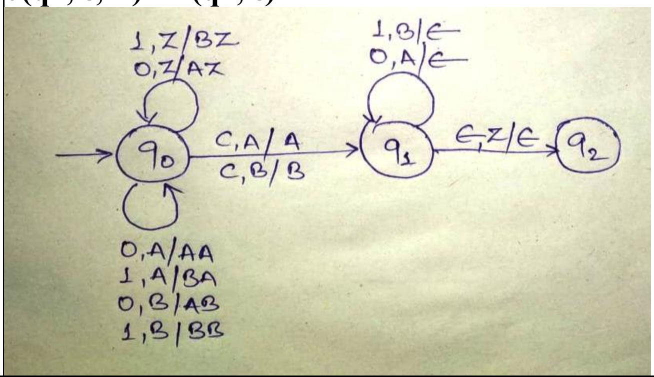
Solution : Left Most Derivation

S → a**B**
→ aa**B**B (Using B → aBB)
→ aaa**B**BB (Using B → aBB)
→ aaab**B**B (Using B → b)
→ aaabb**B** (Using B → b)
→ aaabba**B**B (Using B → aBB)
→ aaabbab**B** (Using B → b)
→ aaabbabb**S** (Using B → bS)
→ aaabbabbb**A** (Using S → bA)
→ aaabbabbba (Using A → a)



Right Most Derivation

S → a**B**
→ aaB**B** (Using B → aBB)
→ aaBaB**B** (Using B → aBB)
→ aaBaBb**S** (Using B → bS)
→ aaBaBbb**A** (Using S → bA)
→ aaBa**B**bba (Using A → a)
→ aa**B**abbba (Using B → b)
→ aaaB**B**abbba (Using B → aBB)
→ aaa**B**babbba (Using B → b)
→ aaabbabbba (Using B → b)

				
2	Construct the PDA to accept the Language L={WCW^R |w belongs to {0,1}*},show the instantaneous descriptors for the string 01C10 Solution : **δ(q0, 0, Z) → (q0, AZ)** **δ(q0, 1, Z) → (q0, BZ)** **δ(q0, 0, A) → (q0, AA)** **δ(q0, 0, B) → (q0, AB)** **δ(q0, 1, A) → (q0, BA)** **δ(q0, 1, B) → (q0, BB)** **δ(q0, C, A) → (q1, A)** **δ(q0, C, B) → (q1, B)** **δ(q1, 0, A) → (q1, ε)** **δ(q1, 1, B) → (q1, ε)** **δ(q1, ε, Z) → (q2, ε)** 	[10]	CO3	L3
3	Define Chomskey Normal form (CNF) and Illustrate the CNF form for the given grammar S→ S+T |T/R , T→T*a |b , R→R* a Solution : CNF is one which has the production of the form A→BC or A→ a S→S S+ T , S→ S A , A→S+T similarly other productions	[10]	CO4	L3
4.	State and Prove pumping lemma for context free Languages, and prove that L={$a^nb^nc^n$ | n>=0 is not context free} Solution : Assume L is context free language Then there is a pumping length n such that any string w εL of length>=n can be written as follows − |w|>=n We can break w into 5 strings, w=uvxyz, such as the ones given below • |vxy| >=n • |vy| # ε • For all k>=0, the string uv^kxy^yz∈L • Let n=4 so, $s=a^4b^4c^4$ • v and y each contain only one type of symbol. • {we are considering only v and y because v and y has power uv^2xy^2z}	[10]	CO4	L3

<table>
<tr><td></td><td>

- aaaa bbbb cccc
- $=uv^kxy^kz$ when k=2
- $=uv^2xy^2z$
- =aaaaaabbbbccccc
- $=a^6b^4c^5$
- (Number of a # number of b #number of c)
- Therefore,The resultant string is not satisfying the condition
- $a^6b^4c^5 \notin L$
- If one case fails then no need to check another condition.

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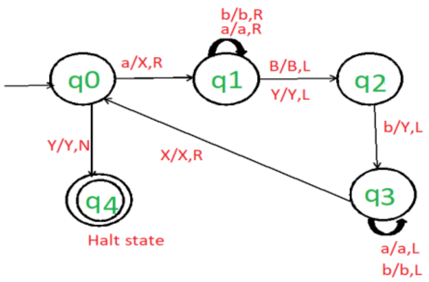
<tr><td>5.</td><td>

Explain Turing Machine, Construct the Turing machine to accept the language $L = \{a^nb^n \}n >=1 \}$ and accept the string aabb.

olution :

Turing machine can be formally described as seven tuples

(Q,X, Σ, δ,q0,B,F)



</td><td>[10]</td><td>CO5</td><td>L3</td></tr>
<tr><td>6.</td><td>

Explain the Programming techniques of Turing machines

Solution :

Storage in finite control

A state that consists of a fixed number of fixed-size components can be made into a tuple. The behaviour of a TM programme can be made simpler by allowing the tuple's components to store a predetermined amount of data.

Example: Keep track of an additional symbol. The actual states of the TM can be [q0, A], [q1, A], [q0, B], or [q1, B] if the "additional data" can be A or B and the "state" can be q0 or q1.

Multiple Tracks:

A particular kind of multi-tape Turing machine called a multi-track Turing machine has numerous tracks, but only one tape head can read and write on each track. One tape head reads n symbols from n tracks in this instance. Recursively enumerable languages are accepted, just like they are for single-track, single-tape Turing machines.

Subroutines

TMs can emulate subroutines, including those that send parameters and use recursion.

Example: Multiplication using a "copy" subroutine

- Given 0m10n1 as input, produce 0mn as output.
- This can be done by "copying" n 0s m time

</td><td>[10]</td><td>CO5</td><td>L2</td></tr>
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