TE/COMP/SB-MT/28-11-23

Duration: 3 hrs [Max Marks: 80]

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

[20]

1

a Differentiate Finite Automata, Push Down Automata and Turing Machine.

b Discuss different applications of Finite Automata

c Design DFA that accepts Strings with at least 3 a's. over $\Sigma=\{a,b\}$.

d Simplify the given grammar
$S \rightarrow ASB \mid \epsilon$
$A \rightarrow aAS \mid a$
$B \rightarrow SbS \mid A \mid bb$

2 a Compare and Contrast Moore and Mealy Machines. Design Moore machine for $\Sigma=\{0,1\}$, print the residue modulo 3 for binary numbers. [10]

b Design Push Down Machine that accepts $L = \{a^m b^n c^n d^m \mid m, n>0 \}$ [10]

3 a i) Construct CFG for given language. $L = \{ 0^i 1^j 0^k \mid j>i+k\}$ [10]
ii) The grammar G is $S \rightarrow aB \mid bA \quad A \rightarrow a \mid aS \mid bAA \quad B \rightarrow b \mid bS \mid aBB$
Obtain parse tree for the following string "aababb" and check if the grammar is ambiguous.

b Explain Pumping Lemma with the help of a diagram to prove that given language is not a regular language. $L=\{0^m 1^{m+1} \mid m>0\}$ [10]

4 a i) Design DFA that accepts Strings that ends in either "110" or "101" over $\Sigma=\{0,1\}$. [10]
ii) Design NFA that accepts strings starting with "abb" or "bba"

b Given NFA with epsilon, Find equivalent DFA. q1 is the initial state, q3 is final state [10]

	0	1	2	ϵ
→q1	{q1}			{q2 }
q2		{q2}		{ q3}
*q3			{ q3}	

5 a Find Equivalent Greibach Normal Form (GNF) for given CFG. [10]
$S \rightarrow AA \mid a$
$A \rightarrow SS \mid b$

b Define and design Turing Machine to accept $0^n 1^n 2^n$ over $\Sigma=\{0,1,2\}$. [10]

6 Write Short notes (Any Two) [20]

a Explain with example Chomsky Hierarchy.

b Post Correspondence Problem.

c Recursive and Recursive enumerable languages.

d TM-Halting Problem.

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