

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.

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[20]

- 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 $S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$ $B \rightarrow b \mid bS \mid aBB$
 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
$\rightarrow q1$	{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.