

Duration: 3 Hours

[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.

- 1** [20]
- a Explain the ways of acceptance by a PDA. [05]
- b Discuss difference in transition function of PDA, TM and FA [05]
- c Design DFA that accepts Strings that contain “ba” or “ab” as suffix over $\Sigma = \{a,b\}$. [05]
- d Construct CFG to generate the language $L = \{a^i b^j c^k \mid k=i+j, i, j \geq 1\}$ [05]
- 2**
- a Represent RE epsilon for $L = \{w : w \text{ has prefix } bab \text{ and suffix } abb \text{ and } w \text{ is a string over } \{a,b\}\}$. Design NFA with epsilon moves for accepting L. Convert it to minimized DFA. [10]
- b Explain Pumping Lemma for regular languages. Prove that given language is not a regular language. $L = \{a^n b^{n+1} \mid n \geq 1\}$ [10]
- 3**
- a The grammar G is $S \rightarrow aB \mid bA, A \rightarrow a \mid aS \mid bAA, B \rightarrow b \mid bS \mid aBB$ Derive using Left Most Derivation(LMD) and Rightmost Derivation (RMD) for the following string “aaabbb”. Draw Parse Tree. [10]
- b Give formal definition of Push Down Automata. Design PDA that accepts odd palindromes over $\{a,b,c\}$, where c exists only at the center of every string. [10]
- 4**
- a i) Design DFA that accepts Strings that are multiples of 4 $\Sigma = \{0,1\}$. [10]
- ii) Design NFA that accepts strings starting with a and ending with a or starting with b and ending in b.
- b Design a Mealy machine to change every occurrence of a with x, b with y and c is kept unchanged. Convert the same to equivalent Moore machine. [10]
- 5**
- a Consider following CFG. Is it already simplified ? Explain you answer. Convert it to CNF form. [10]
- $S \rightarrow ASB \mid a \mid bb$
- $A \rightarrow aSA \mid a$
- $B \rightarrow SbS \mid bb$
- b Design a TM for converting a input binary number to its one’s complement of a binary [10]

number.

6 Write Short notes (**Any Four**)

[20]

- a Chomsky Hierarchy
 - b Post Correspondence Problem.
 - c Arden's Theorem
 - d TM-Halting Problem.
 - e Variants of Turning Machines
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