

Total No. of Questions : 8]

[Total No. of Printed Pages : 2

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## MCA-304

### M.C.A. III Semester

Examination, June 2020

### Theory of Computation

Time : Three Hours

Maximum Marks : 70

**Note :** i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Construct Moore machine to calculate residue mod 5 for each binary string treated as binary integer.

b) Prove by principle of induction  $\sum_{i=1}^n i = \frac{n(n+1)}{2}$ .

2. a) Design Finite automata for the given regular expression  $(a+b)^*ba$

b) What are the basic difference between Mealy machine and Moore machines? How a Moore machine can be converted into a mealy machine?

3. a) State and prove Pumping lemma for regular sets. What are its applications?

b) Show that regular languages are closed under union, concatenation, complement and intersection.

4. a) Construct a CFG (Context Free Grammar) for the following languages

i)  $L = a^n b^{2n} c^m d^{3m} | n, m > 1$

ii)  $L = a^n b^m c^m d^n | n, m > 1$

MCA-304

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[2]

b) Convert the following Grammar into GNF

$$E \rightarrow \epsilon \quad T/T$$

$$T \rightarrow T * F/F$$

$$F \rightarrow (E)/a$$

5. a) For all string 's' over the alphabet {0, 1} construct a PDA to accept 's' where s = Reverse (s).  
b) Show that for every context free language there exist an accepting PDA.
6. a) Construct Turing Machine for following language  
i) Reverse of string i.e.  $f(w) = W^R \quad w \in \{a,b\}^*$   
b) What is Halting problem of Turing machines and what is its significance? Explain.
7. a) Find the context sensitive grammar for the following language  
 $L = a^n b^n c^n / n \geq 1$   
b) What is Undecidability? Describe post correspondence problem.
8. Write short notes on any three of the following:  
a) Linear Bounded Automata  
b) 2DFA  
c) Chomsky classification  
d) CNF  
e) Recursively enumerable sets

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