

**2021-24**

Full Marks : 60

Time : 3 Hours

Sem-5

*Candidates are required to give their answer in their own words as far as practicable. Their figures in the margin indicate full marks.*

Answer from **both** the Sections as directed.

**Section - A**

1. Choose the **correct** answer of the following :

1×10=10

(i) The minimum number of states required to recognize an octal number divisible by 3 are/is :

- (a) 1 (b) 3  
(c) 5 (d) 7

(ii) A DFA cannot be represented in the following format :

- (a) Transition graph  
(b) Transition Table  
(c) ~~C code~~  
(d) None of these

- (iii) A finite automata recognizes :
- (a) Any language
  - (b) Context sensitive language
  - (c) Context free language
  - ☒ (d) Regular language
- (iv) The entity which generate language is termed as :
- (a) Automata
  - (b) Tokens
  - ☒ (c) Grammar
  - (d) Data
- (v) A turing machine that is able to stimulate other turing machines is :
- (a) Nested turing machine
  - (b) Universal Turing Machine
  - (c) Counter Machine
  - (d) None of these
- (vi) Concatenation operation refers to which of the following set operations :
- (a) Union
  - (b) Dot
  - (c) Kleene
  - (d) Two of the options are correct

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- (vii) The value of  $n$  if turing machine is defined using  $n$ -tuples.
- (a) 6
  - ☒ (b) 7
  - (c) 8
  - (d) 5
- (viii) RASP stands for :
- (a) Random Access Storage Program
  - (b) Random Access Stored Program
  - (c) Randomly Accessed Stored Program
  - (d) Random Access Storage Programming
- (ix) While applying pumping lemma over a language we consider a string  $W$  that belong to  $L$  and fragment it into \_\_\_\_ parts.
- (a) 2
  - (b) 5
  - (c) 3
  - (d) 6
- (x) Maximum number of states of a DFA converted from an NFA with  $n$  states is :
- (a)  $n$
  - (b)  $n^2$
  - (c)  $2n$
  - (d) None of these

2. What are Formal languages ? Explain briefly. 5

#### Section - B

Answer any three questions of the following :  
15×3=45

☒ 3. (a) Differentiate between DFA and NFA

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(b) Construct a DFA to accept strings of 0's and 1's ending with 101

4. What do you mean by Turing Machine ? What are the primary objectives of Turing machine ? Explain halting problem of Turing Machine with suitable example.

5. What are ambiguities in grammars and languages ? Explain briefly and also explain terminal and non-terminal symbols of a grammar.

6. (a) How NFA to DFA conversion is done? Explain with example.

(b) Explain closure properties of Regular languages.

7. What do you mean by pushdown Automata ? Explain, in detail with example.

8. Write short notes on any **three** of the following :

5×3=15

(i) Parse tree

(ii) Kleene star

(iii) Transition graph

(iv) Pumping Lemma

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