

Total No. of Questions : 5]

SEAT No. :

P-1305

[Total No. of Pages : 2

[6055]-306

T.Y. B.Sc.

COMPUTER SCIENCE

CS - 356 : Theoretical computer science

(2019 Pattern) (CBCS) (Semester - V)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any Eight of the following : (out of TEN)

[8 × 1 = 8]

- a) Write output function λ of Moore and Mealy machines.
- b) List all the proper prefixes of the string "ABCD".
- c) Define Nullable symbol.
- d) Give formal definition of Pushdown Automata.
- e) Define right linear grammar.
- f) State True or False. DFA do not have multiple final states.
- g) Name the type of language accepted by Turing Machine.
- h) Write the tuples of LBA.
- i) State true or false. Pumping lemma is used to show that language is not context tree.
- j) Write smallest possible string accepted by the following regular expression. $10+(0+11)0^*1$

Q2) Attempt any four of the following :

[4 × 2 = 8]

- a) Explain Reduction with the help of example.
- b) Construct FA for regular expression. $(01+10)^*+11$
- c) Differentiate between DFA and NFA.

P.T.O.

- d) Write down the ϵ -closure of each state from the following FA.



- e) Define types of Turing Machine.

Q3) Attempt any two of the following : (Out of THREE) [2 × 4 = 8]

- a) Construct a DFA for a language over $\Sigma = \{0,1\}$
 $L1 \cap L2$
 $L1 = \{ \text{All strings starting with '0'} \}$
 $L2 = \{ \text{All strings not having '01' as substring} \}$
- b) Construct the following CFG in Normal Form (CNF)
 $S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb$
- c) Construct TM which accepts the language that start with 0 and ends with 1.

Q4) Attempt any two of the following : (Out of THREE) [2 × 4 = 8]

- a) Construct a PDA for the language $L = \{a^n b^n \mid n \geq 1\}$
- b) Construct a Mealy machine for the language L over $\Sigma = \{0, 1\}$ which outputs 'A' if it has substring '101'. it outputs 'B' if it has substring '110', otherwise it outputs 'C'.
- c) Write a short note on Chomsky's hierarchy.

Q5) Attempt any one of the following : (Out of TWO) [1 × 3 = 3]

- a) Construct a Moore machine over alphabet $\{0,1\}$ to get 1's complement of a given binary string.
- b) Show that $L = \{0^n 1^n \mid n \geq 1\}$ is not regular.

x x x