

Total No. of Questions : 5]

SEAT No. :

PA-1028

[Total No. of Pages : 2

[5902]-56

T.Y. B.Sc. (Semester - V)

COMPUTER SCIENCE

CS-356 : Theoretical Computer Science  
(2019 Pattern) (CBCS)

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) Define Unit production of grammar.
- b) Construct Melay machine which toggles its input.
- c) Explain proper Suffix and Prefix of a string with one example.
- d) Give formal definition of Push down Automata.
- e) Define left linear and right linear grammar.
- f) State True or False. Finite Automata has an infinite number of states.
- g) Name the types of normal forms of grammar.
- 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.

$10 + (0 + 11)0^*1$

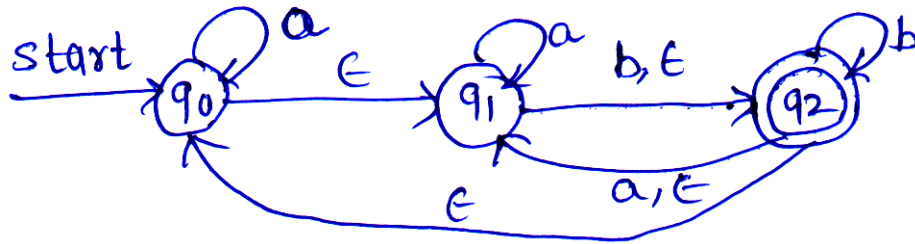
Q2) Attempt any FOUR of the following (Out of FIVE).

[4 × 2 = 8]

- a) Explain types of grammar.
- b) Construct FA for regular expression.  
 $(01+10)^*+11$
- c) Differentiate between FA and PDA (any two points).

P.T.O.

- d) Write down the  $\epsilon$ -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

$$L1 \cap L2$$

$L1 = \{ \text{All strings starting with 'a'} \}$

$L2 = \{ \text{All strings not having 'ab' as substring} \}$

- b) Construct the following CFG into Normal Form (CNF)

$$S \rightarrow ABA$$

$$A \rightarrow aA \mid \epsilon$$

$$B \rightarrow bB \mid \epsilon$$

- c) Design TM for language,

$$L \{ WCW^R \mid W \text{ is in } (0+1)^* \}$$

**Q4)** Attempt any TWO of the following (Out of THREE). [2 × 4 = 8]

- a) Construct a PDA for the language

$$L = \{ 0^n 1^m 2^{n+m} \mid n, m \geq 1 \}$$

- b) Construct a Moore machine for the language L over  $\Sigma = \{0, 1\}$  which outputs '\*' if the string contains '11' in it and outputs '#' otherwise.

- c) Compare DFA and NFA.

**Q5)** Attempt any ONE of the following (Out of TWO). [1 × 3 = 3]

- a) Construct a Mealy machine to convert each occurrence of substring 101 by 100 over alphabet  $\{0,1\}$ .

- b) Show that  $L = \{0^n 1^n \mid n \geq 1\}$  is not regular.

