

Total No. of Questions : 8]

PD4322

SEAT No. :

[Total No. of Pages : 2

[6403]-120

T.E (Information Technology)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - V) (314441)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Construct CFG for the language L which consists of strings over $\{0,1\}^*$ with at least one occurrence of "000". [4]
- b) Explain any three closure properties of Context Free language. [6]
- c) Convert the following grammar to CNF. [8]

$S \rightarrow PQP$

$P \rightarrow QP \mid \epsilon$

$Q \rightarrow 1Q \mid \epsilon$

OR

- Q2)** a) Consider the following grammar [8]
- $S \rightarrow aAS \mid a$
- $A \rightarrow SbA \mid SS \mid ba$
- Derive the string "aabbba" using
- i) Leftmost derivation
 - ii) Rightmost derivation
 - iii) Parse tree
- b) Convert the following LLRG to RLRG. [6]
- $S \rightarrow B1 \mid A0 \mid C0$
- $A \rightarrow C0 \mid A1 \mid B1 \mid 0$
- $B \rightarrow B1 \mid 1$
- $C \rightarrow A0$
- c) Explain Chomsky Hierarchy of grammar. [4]

P.T.O.

- Q3)** a) Construct PDA for the following CFG. [6]
 $S \rightarrow 0SX \mid 1SY \mid \varepsilon \quad X \rightarrow 1 \quad Y \rightarrow 0$
 b) Write formal definitions of [4]
 i) Deterministic PDA
 ii) Non-deterministic PDA
 c) Define post machine. Design PM to check well formedness of parentheses. [7]

OR

- Q4)** a) Compare finite automata and push down automata. [4]
 b) Design a PDA for the language $L = \{a^n b^m c^n \mid m, n \geq 1\}$ [6]
 c) Define Push down Automata. Explain different types of PDA. Explain any two applications of PDA. [7]

- Q5)** a) Explain the power of Turing machine over Finite Automata. [4]
 b) Design a Turing machine to accept language $L = \{0^n 1^n \mid n \geq 1\}$. Explain with diagram and transition table. [8]
 c) Explain Halting Problem of Turing Machine. [6]

OR

- Q6)** a) Write a note on variants of Turing machine. [8]
 b) Explain solvable problems and unsolvable problems. [4]
 c) Construct a Turing machine for 1's complement of a binary number. [6]

- Q7)** a) Show that for two recursive languages L_1 and L_2 , each of the following are recursive. [9]
 i) $L_1 \cup L_2$
 ii) $L_1 \cap L_2$
 b) Write a note on Node-Cover Problem. [8]

OR

- Q8)** a) What do you mean by polynomial time reduction? Explain with a suitable example. [8]
 b) Define P-class problems and NP- class problems. Explain them with suitable examples. [9]

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