Total No. of Questions : 8]

SEAT No. : [ ]

PD4322

[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]**

$S \rightarrow PQP$

$P \rightarrow QP|\in$

$Q \rightarrow 1Q|\in$

OR

Q2) a) Consider the following grammar **[8]**

$S \rightarrow aAS \mid a$

$A \rightarrow SbA \mid SS \mid ba$

Derive the string "aabbaa"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]**

$S \rightarrow 0SX \mid 1SY \mid \varepsilon$ $X \rightarrow 1$ $Y \rightarrow 0$

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 $L = \{a^n b^m c^n \mid m, n >= 1\}$ **[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 $L=\{0^n1^n \mid n >= 1\}$. 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 L1 and L2, each of the following are recursive. **[9]**

i) $L1 \cup L2$

ii) $L1 \cap L2$

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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