Total No. of Questions : 8]

SEAT No. : ____

PA-1499

[Total No. of Pages : 3

[5926]-119

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester - I) (314441)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, 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) What is a Regular Grammar? Explain types of regular grammar. **[5]**

b) Simplify the following CFG. **[6]**

$S \rightarrow ABA$

$A \rightarrow aA \mid \varepsilon$

$B \rightarrow bB \mid \varepsilon$

c) What is ambiguous grammar? Show that the following grammar is ambiguous and find the equivalent unambiguous grammar. **[7]**

$E \rightarrow E + E \mid E * E \mid (E) \mid I$

$I \rightarrow a \mid b$

OR

Q2) a) Write CFG for the language $L = \{a^i b^j c^k \mid i = j + k \ \& \ j, k >= 1\}$. **[6]**

b) Check whether the given language is CFL or not $L=\{a^n b^n c^n \mid n>=0\}$. **[6]**

c) Covert the following RLG to FA. **[6]**

$S \rightarrow 0A \mid 1B \mid 0 \mid 1$

$A \rightarrow 0S \mid 1B \mid 1$

$B \rightarrow 0A \mid 1S$

P.T.O.

Q3) a) Define Post machine. **[3]**

b) Design a PDA for accepting language L= { w c w^R | w ∈ (a, b)*}. **[6]**

c) Define Push down Automata. Explain different types of PDA. Explain any two applications of PDA. **[8]**

OR

Q4) a) Design a Pushdown Automata for the following language **[7]**

L = {a^n c b^n | n ≥ l}

b) Convert the grammar **[6]**

S → 0S1 | A

A → lA0 | S | ε

to PDA that accepts the same language by empty stack.

c) Compare Finite Automata and Pushdown Automata. **[4]**

Q5) a) Write a note on Universal turing Machine. **[5]**

b) Explain post correspondance problem with a suitable example. **[6]**

c) Construct a Turing machine to find 2's complement of a binary number. **[7]**

OR

Q6) a) Design a Turing Machine to increment value of binary number by one. **[8]**

b) Write short notes on **[6]**

i) Unsolvable problems

ii) Applications of Turing Machine

c) What are recursive and recursively enumerable languages? **[4]**

Q7) a) What is a Traveling Salesman Problem? Justify that it is a NP-class problem. **[8]**

b) Write short notes on **[9]**

i) A Simple Un-decidable problem

ii) Measuring Complexity

OR

Q8) a) Explain Cook's theorem in detail. **[8]**

b) Explain in detail the Node-Cover Problem. **[9]**

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