P-482

[6003]-701

T.E. (Information Technology)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - I) (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, Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate marks.*
4) *Assume suitable data, if necessary.*

Q1) a)   Eliminate useless symbols from the following grammar.   **[6]**

     S → aA | bB

     A → aA | a

     B → bB

   b)   Prove that CFL's are closed under union, concatenation, Kleene's closure.

     [6]

   c)   What is an ambiguous grammar? Explain with a suitable example.   **[6]**

<div align="center">OR</div>

Q2) a)   Convert the following CFG to Chomsky Normal Form (CNF)   **[8]**

     S → aAbB

     A → aA

     B → bB | b

   b)   Construct NFA for the following left linear regular grammar.   **[6]**

     S → B1 | A0 | C0

     B → B1 | 1

     A → A1 | B1 | C0 | 0

     C → A0

   c)   Write a note on Pumping lemma for CFL.   **[4]**

P.T.O.

Q3) a) Design a Pushdown Automata for the language L={$a^n b^{2n}$ | n > 0}. **[6]**

b) Construct a PDA equivalent to the following CFG. **[6]**

S → 0BB

B → 0S | 1S | 0

c) Write a note on Post machine. **[5]**

OR

Q4) a) Design a Pushdown Automata which accepts only odd number of b's over $\sum = \{a, b\}$. Simulate PDA for the string "bbaba". **[8]**

b) Explain the acceptance by PDA **[6]**

i) By final state

ii) By empty stack

c) Define Push down Automata. **[3]**

Q5) a) Design a Turing machine to accept language L = {$a^n b^n c^n$ | n > 0}. **[7]**

b) Write a short note on Post Correspondence problem. **[5]**

c) Differentiate between Push Down Automata and Turing Machine. **[6]**

OR

Q6) a) Explain Church Turing hypothesis. **[3]**

b) Design a Turing machine to add two unary numbers. **[7]**

c) Write a short notes on Universal Turing machine. **[8]**

Q7) a) Explain in detail Decidable problems concerning regular languages. **[5]**

b) Explain the satisfiability problem with an example. **[6]**

c) What is Polynomial time reduction? Explain it with a suitable example. **[6]**

OR

Q8) a) Show that for two recursive languages L_1 and L_2, $L_1 \cup L_2$ is also recursive. **[4]**

b) What do you mean by NP-Complete problems? List the problems in this class and explain any one problem in detail. **[7]**

c) What do you mean by Mapping Reducibility? Explain it with an example. **[6]**

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