Total No. of Questions : 8]

SEAT No. :

P-482

[Total No. of Pages : 2

[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]**

$S \rightarrow aA \mid bB$

$A \rightarrow aA \mid a$

$B \rightarrow bB$

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]**

OR

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

$S \rightarrow aAbB$

$A \rightarrow aA$

$B \rightarrow bB \mid b$

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

$S \rightarrow B1 \mid A0 \mid C0$

$B \rightarrow B1 \mid 1$

$A \rightarrow A1 \mid B1 \mid C0 \mid 0$

$C \rightarrow A0$

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

P.T.O.

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

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

$S \rightarrow 0BB$

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

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 = $\{a^n\ b^n\ c^n \mid n > 0\}$. **[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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