Total No. of Questions : 8]

SEAT No. :

P2989

[Total No. of Pages : 2

[5669]-581

T.E. (Computer Engineering) (Semester - I)

THEORY OF COMPUTATION

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Define the following terms with example. **[6]**

i) Alphabet

ii) String

iii) Language

b) What are the different types of Normal Forms of Context Free Grammar? Explain it with example. **[6]**

c) Construct a Finite Automata for the following Regular Expressions. **[8]**

i) (1+0)* (00+11+10)

ii) 1(01+10)*+0(11+10)*

OR

Q2) a) Simplify the following Context Free Grammar (CFG). **[6]**

$S \rightarrow ASB \mid \in$

$A \rightarrow aAS \mid \in$

$B \rightarrow Sbs \mid A \mid bb$

G = {(S,A,B), (a,b), S,P : Productions are given above).

b) Construct a Mealy Machine for 2's complement of a binary number. **[6]**

c) Construct a Deterministic Finite Automata (DFA) for the following. **[8]**

i) L = {0,1 | Accept all the strings ending in 00 or 11}.

ii) Accept a binary number divisible by 3.

P.T.O.

Q3) a) Write a short note on Halting Problem of Turing Machine. **[4]**

b) Construct a Turing Machine to find 2's complement of a binary number. **[6]**

c) Construct a Turing Machine to add two unary numbers. **[8]**

OR

Q4) a) Explain the power of Turing Machine over Finite Automata. **[4]**

b) Construct a Turing Machine for the language L = $\{a^n b c^n \mid n>=1\}$ **[6]**

c) Construct a Turing Machine which accepts odd length palindrome over the $\sum = \{a, b\}$. **[8]**

Q5) a) Define Pushdown Automata (PDA)? What are the different types of PDA? Explain any two applications of PDA? **[6]**

b) Design a PDA for accepting a language L = $\{a^n b^m c^n \mid m,n>= 1\}$ **[6]**

c) Explain the acceptance of language by PDA - **[4]**

i) By Final State

ii) By Empty Stack

OR

Q6) a) Design a PDA for accepting language L = $\{ W c W^R \mid W \in (a,b)^*\}$. **[6]**

b) Give Context Free Grammar (CFG) generating the language accepted by the PDA M = $\{(q_0, q_1), (a, b), \delta, q_0, Z_0, q_1\}$ where δ is as follows.

$\delta\ (q_0, a, Z_0) \rightarrow (q_0, XZ_0)$

$\delta\ (q_0, a, X) \rightarrow (q_0, XX)$

$\delta\ (q_0, b, X) \rightarrow (q_1, \in)$

$\delta\ (q_1, b, X) \rightarrow (q_1, \in)$

$\delta\ (q_1, \in, Z_0) \rightarrow (q_1, \in)$

c) Prove that "Let L be a language accepted by deterministic PDA, then the complement of L,can also be accepted by, deterministic PDA. **[4]**

Q7) a) Write a short note on Post Correspondence Problem. **[6]**

b) What are Tractable and Intractable problems? Explain it. **[6]**

c) Differentiate between P-class problems and NP-class problems. **[4]**

OR

Q8) a) What is Travelling Salesman Problem? Justify that it is a NP-class Problem. **[6]**

b) Write a short note on Node-Cover Problem. **[6]**

c) What is Polynomial Time Reduction? Explain It with suitable example. **[4]**