Total No. of Questions :8]

SEAT No. : ____

P2892

[Total No. of Pages :3

[4958]-1085
T.E. (Computer)
THEORY OF COMPUTATION
(2012 Course) (Semester - I) (310241)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Determine a Regular Expression over the alphabets {x, y} for the following

i) All strings containing exactly two x's

ii) All strings that do not end with xy

iii) All strings starting with yy **[6]**

b) Define Pumping Lemma and apply it to prove the following

$L = \{0^m 1^n 0^{m+n} \mid m>=1 \text{ and } n>=1\}$ is not regular **[6]**

c) Give the Right & Left linear grammar for the following DFA shown in Fig1 **[8]**

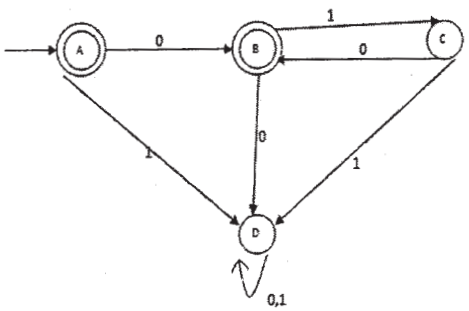

Fig 1

OR

P.T.O.

Q2) a) State Principle of Mathematical Induction and apply it to show that $n^4 - 4n^2$ is divisible by 3 for all $n>0$. **[6]**

b) Make use of Arden's theorem to determine the regular expression for the finite automata shown in fig 2. **[6]**

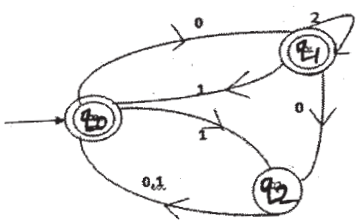

Fig 2

c) Construct a DFA for the following left linear grammar **[8]**

$S \rightarrow B1|A0|C0, \quad B \rightarrow B1|1, \quad A \rightarrow A1|B1|C0|0, C \rightarrow A0$

Q3) a) What is a Turing Machine? Give the formal definition of TM. Design a TM that replaces every occurrence of abb by baa. **[9]**

b) Write short note on: **[9]**

i) Universal Turing Machine (UTM)

ii) Recursively Enumerable Languages.

iii) Halting Problem of Turing Machine.

OR

Q4) a) What is a post machine? Give formal definition of Post Machine. Construct a Post Machine for Accepting strings with equal number of $a^{'s}$ & $b^{'s}$. **[9]**

b) What are the different ways for extension of TM? Explain. Construct a two tape TM to convert an input W into WW^R. **[9]**

Q5) a) Construct a PDA that accept $L = \{a^n b^n \mid n \geq 1\}$ through Empty stack. **[7]**

b) Obtain CFG for the PDA given below: **[9]**

$\delta(q_0, 1, z_0,) = \{q_0, xz_0,\}$ $\quad$ $\delta(q_0, 1, x) = \{q_0, xx\}$

$\delta(q_0, 0, x) = \{q_1, x\}$ $\quad$ $\delta(q_0, \varepsilon, z_0,) = \{q_0, \varepsilon\}$

$\delta(q_1, 1, x) = \{q_1, \varepsilon\}$ $\quad$ $\delta(q_0, 1, z_0,) = \{q_0, z_0\}$

OR

Q6) a) What is PDA? What are the different types of PDA? Give its applications. **[6]**

b) What is NPDA? Construct a NPDA for The set of all strings over {a,b} with even length palindrome. **[10]**

Q7) a) What do you mean by Polynomial Time Reduction? Explain with suitable example. **[8]**

b) What is Clique Problem? Show that it is a NP-Complete problem. **[8]**

OR

Q8) a) What do you mean by NP-Problems? Justify why the Travelling Salesman problem is a NP-Problem. **[8]**

b) What is Kruskal's Algorithm? How can we solve this problem using Turing Machine? **[8]**