Total No. of Questions :8]

May - 2016

SEAT No. :

P2892

[4958]-1085

[Total No. of Pages :3

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]

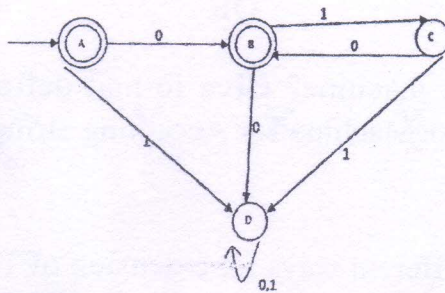   c)   Give the Right & Left linear grammar for the following DFA shown in Fig1   [8]

Fig 1

OR

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]**
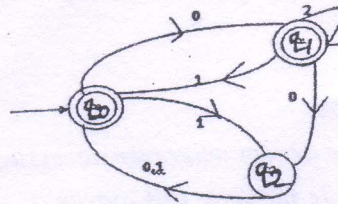

Fig 2

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

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

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]

$$\delta(q_0, 1, z_{0,}) = \{q_0, xz_{0,}\} \qquad \delta(q_0, 1, x) = \{q_0, xx\}$$
$$\delta(q_0, 0, x) = \{q_1, x\} \qquad \delta(q_0, \varepsilon, z_{0,}) = \{q_0, \varepsilon\}$$
$$\delta(q_1, 1, x) = \{q_1, \varepsilon\} \qquad \delta(q_0, 1, z_{0,}) = \{q_0, z_0\}$$

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]

✗   ✗   ✗