

Total No. of Questions :8]

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

$L = \{0^m 1^n 0^{m+n} \mid m \geq 1 \text{ and } n \geq 1\}$  is not regular

[6]

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

[8]

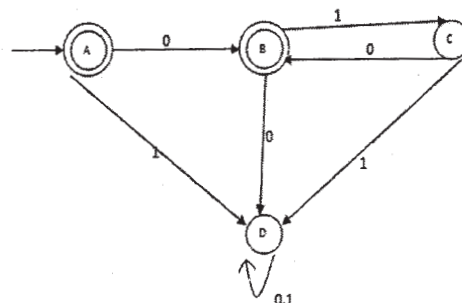


Fig 1

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]

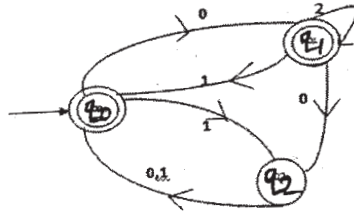


Fig 2

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

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

- 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]
- Universal Turing Machine (UTM)
  - Recursively Enumerable Languages.
  - 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]

$$\begin{array}{ll} \delta(q_0, 1, z_0) = \{q_0, xz_0\} & \delta(q_0, 1, x) = \{q_0, xx\} \\ \delta(q_0, 0, x) = \{q_1, x\} & \delta(q_0, \epsilon, z_0) = \{q_0, \epsilon\} \\ \delta(q_1, 1, x) = \{q_1, \epsilon\} & \delta(q_0, 1, z_0) = \{q_0, z_0\} \end{array}$$

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]

**x x x**