

**R13**

Code No: 114AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, May - 2015

FORMAL LANGUAGES AND AUTOMATA THEORY

(Computer Science and Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A**

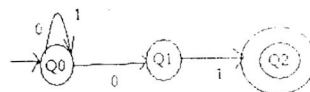
(25 Marks)

- 1.a) Define  $\delta$  in NFA with  $\epsilon$  (Epsilon) moves. [2M]
- b) Design NFA to accept set of all strings does not contain 3 consecutive zeros. [3M]
- c) Define Left Linear Grammar. [2M]
- d) Define Recursive Definition for Regular Expression. [3M]
- e) Define UNIT Production. [2M]
- f) When Will you say that Grammar is Left Recursive? How to eliminate Left recursion. [3M]
- g) Give Instantaneous Description ID of Turing Machine. [2M]
- h) Define Linear Bounded Automaton. [3M]
- i) Give any two examples of Undecidable Problems. [2M]
- j) Give any three examples of recursive languages. [3M]

**PART-B**

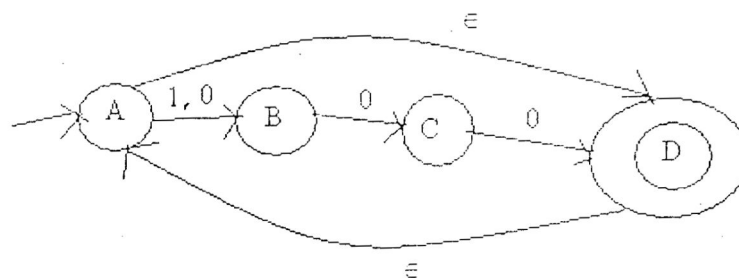
(50 Marks)

- 2.a) Design a DFA to accept strings with 0's and 1's such that the number of 1's should be even.
- b) Construct DFA for given NFA. [4+6]



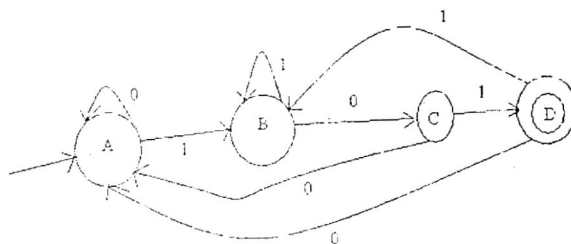
OR

- 3.a) Construct NFA for given NFA with  $\epsilon$ -moves.



- b) Define Moore Machine. [8+2]

4. Obtain a regular expression for the following FA. [10]



OR

5. Construct a DFA accepting language represented by  $0^*1^*2^*$ ? [10]

6. Convert the following grammar to Greibach Normal Form

$G = (\{A_1, A_2, A_3\}, \{a, b\}, P, A)$

Where P consists of the following

$A_1 \rightarrow A_2 A_3$

$A_2 \rightarrow A_3 A_1 \mid b$

$A_3 \rightarrow A_1 A_2 \mid a$

[10]

OR

7. Design Push Down Automata for the language  $L = \{a^n b^{2n} \mid n \geq 1\}$ . [10]

8. Design Turing Machine for multiplication of two unary numbers. [10]

OR

9. Design Turing Machine  $L = \{a^n b^n c^n \mid n \geq 1\}$ . [10]

10. Define the following and give examples:

a) NP – type problem

b) NP – complete problem.

[5+5]

OR

11. Write briefly about the following:

a) Decidability of problems

b) Define PCP. Give the solution of PCP  $A = (ba, ab, a, baa, b)$  and  $B = (bab, baa, ba, a, aba)$ . [5+5]

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