B.Tech. Degree IV Semester Examination April 2019

CS 15-1404 AUTOMATA LANGUAGES AND COMPUTATIONS
(2015 Scheme)

Time: 3 Hours   Maximum Marks: 60

PART A
(Answer *ALL* questions)

$(10 \times 2 = 20)$

I. (a) Differentiate NFA and DFA.

    (b) Compare Moore and Mealy machine.

    (c) Construct a DFA which accept set of all strings over {a, b} which starts and ends with different symbol.

    (d) List the closure properties of regular sets.

    (e) Construct the FA corresponding to the following regular grammar.

$$S \ \text{->} \ a \mid aA \mid bB \mid \varepsilon$$
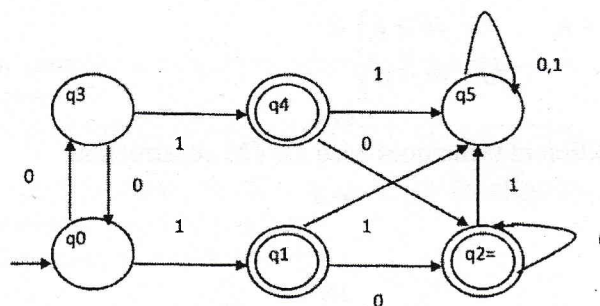
$$A \ \text{->} \ aA \mid aS$$

$$B \ \text{->} \ cS \mid \varepsilon$$

    (f) State whether the CFG, A -> A + A/A − A/a is ambiguous and justify your answer.

    (g) Distinguish NPDA and DPDA.

    (h) Discuss the equivalence of acceptance by final state and empty stack.

    (i) Explain Universal TM.

    (j) Illustrate the model of LBA.
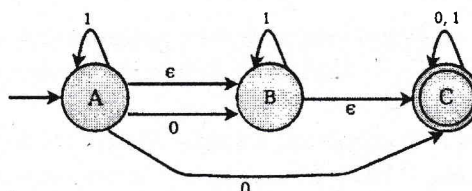
PART B

$(4 \times 10 = 40)$

II. (a) Construct a DFA to accept strings over {a, b} containing even number of   (4)
          a's and b's.

     (b) Minimize the DFA.   (6)

OR

III.   Construct NFA without ε moves equivalent to the following NFA with ε (10)
          moves.

IV. (a) State and prove the pumping lemma for regular languages   (5)

    (b) Show that, the language L = {$0^i 1^i$ / i is an integer and i>=1) is not regular.   (5)

OR

V. (a) Prove the equivalence of regular expression and finite automata.   (6)

    (b) Using Arden's Theorem to find Regular Expression of Deterministic Finite   (4)
automata.
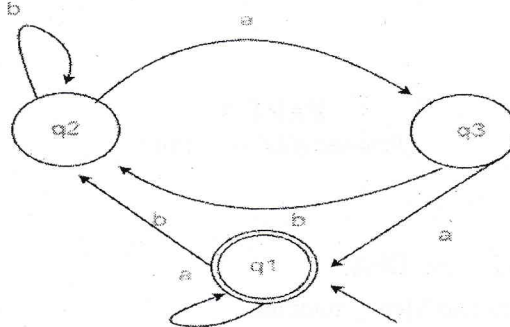
VI. (a) Construct a CFG representing the set of all palindromes over (0+1)*.   (5)

    (b) Convert the CFG to GNF.   (5)

        S->XA/BB

        B->b/SB

        X->b

        A->a

OR

VII. (a) Simplify the CFG.   (5)

        S->aA/aBB

        A->aAA/ε

        B->bB/bbC

        C->B

    (b) Convert the CFG to CNF.   (5)

        S->aAB

        A->aA/a

        B->aB/b

VIII. (a) Discuss about Chomsky hierarchy.   (5)

    (b) Design a TM to compute proper subtraction.   (5)

$$\begin{cases} m-n & for \ m \geq n \\ 0 & for \ m < n \end{cases}$$

OR

IX. Discuss the different techniques used for TM construction.   (10)

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