Code: R7310501

$\boxed{\text{R7}}$

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Prove the following theorem by Induction.
$$1 + 2 + 3 + \ldots\ldots\ldots + n = n(n + 1)/2$$
   (b) A tree with 'n' vertices has (n-1) edges. Prove the following theorem by induction.

2   Design a Moore machine that will read sequences made up of letters A.E.I.O.U and
        will give as output the same sequences except that in case where can I directly
        follows an E, it will be changed to U. Design the Mealy machine for the same.

3   For each of the languages given below. Design a finite automata and regular
        expressions to recognize them. In all cases the alphabet is {0, 1}
   (a) $L_1 = \{w|w$ does not contain the substring 110$\}$.
   (b) $L_2 = \{w|w$ contains and even number of 0's and exactly two 1's$\}$.

4 (a) What are the properties of the CFL generated by a CFG?
   (b) Find the grammar for the language $L = \{a^{2n} bc$, where $n > 1\}$
   (c) Find the language generated by $S \rightarrow 0S1|0A|0|1B|1$, $A \rightarrow 0A|0$, $B \rightarrow 1B|1$.

5   Define Griebach normal form for a CFG. Find GNF for the following grammar.
        $E \rightarrow E+T / T \qquad T \rightarrow T{*}F / F \qquad F \rightarrow (E) / a$

6 (a) Design a PDA for $L = \{xx^r / x \in \{a, b\}^*\}$. Process the string abbaabba. Is you PDA
        deterministic or non deterministic? Justify your answer.
         Note: x^r stands for reverse of the string x.
   (b) Explain the differences between a PDA and a FA.

7   Design a TM for multiplication of two positive integers.
        Discuss any two modifications to the basic model of TM.

8 (a) Explain about Turing reducibility.
   (b) What is PCP? Give solution to the following PCP, if exists.
        $W = (00, 001, 1000) \qquad X = (0, 11, 011)$

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