| BICS-010 |

B.Tech. IN COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

June, 2011

BICS-010 : FORMAL LANGUAGES AND AUTOMATA

Time : 3 hours   *Maximum Marks : 70*

Note : There are seven Question. Question No. 7 is compulsory. Attempt any four more question out of question number 1 to 6.
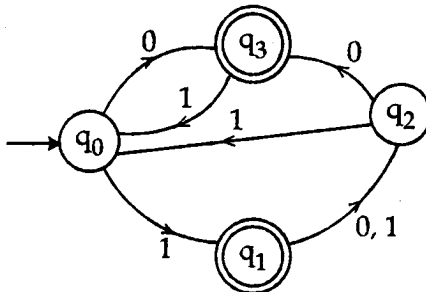
1. (a) Define the Chomsky hierarchy of language.   8
         Find the language generated by following
         grammar
         $G = (\{S, A\}, \{a, b, c\}, P, S)$ where P is defined
         as

         $S \rightarrow aSb \,|\, A$

         $A \rightarrow aAc \,|\, \epsilon$

    (b) Minimize the following automata   6

2. (a) Construct the finite automata for following 7
        language

    (i)   all string with even no. of 0's and 1's
          over alphabet {0, 1}.

    (ii) all string over {0, 1} whose decimal
          equivalent is divisible by 3.

    (b) Illustrate the pumping Lemma for 7
        formal language. Prove that language
        $L = \left\{ 0^{i^2} \mid i \geq 0 \right\}$ is not regular.

3. (a) Show that CFG, G with following 7
        production $S \to a \mid Sa \mid bSS \mid SSb \mid SbS$ is an
        ambiguous grammar. Convert the above
        grammar into unambiguous grammar.

    (b) Convert the grammar in Chomosky Normal 7
        form

        $S \to ABa$

        $A \to aab$

        $B \to Ac$

4. (a) Design a PDA to accept the following 7
        language

        $L = \left\{ 0^n 1^n \mid n \geq 1 \right\}$

(b) Prove or disprove whether the following 7
language is context free or not ?

(i) $L = \left\{ a^n b^n a^n \mid n \geq 0 \right\}$

(ii) $L = \left\{ a^n b^n c^m \mid n \geq 1, m \geq 0 \right\}$

5. (a) Define a Turing Machine mathematically. 8
For $\Sigma = \{a, b\}$ design a TM that accepts the

language $L = \left\{ a^n b^n \mid n \geq 1 \right\}$.

(b) Explain the post correspondence problem. 6
Find at least three solution to PCP defined
by the dominoes

1	10	10111
111	0	10

6. (a) Prove that a language is recursively 7
enumerable if and only if its complement is
recursively enumerable.

(b) In context of primitive recursive function 7
state the initial function and rules of
primitive recursion and composition.

7. Write down the short notes on following. Attempt 14
any four :
(a) Halting Problem
(b) Undecidability
(c) Mealy Machine Vs Moore Machine
(d) Universal Turing Machine
(e) NPDA