The Open University of Sri Lanka
B.Sc. Degree Programme- Level 05
Department of Mathematics and Computer Science
CSU3275/PMU3293-Automata Theory
Open Book Test(OBT)-2011/2012
Duration: One &half hours

Date :22.03.2012	Time:4.00pm-5.30pm

Answer all questions.

Question 01

(a) Check whether the languages generated by the following pairs of expressions are identical or not. Justify your answer.

   (i)   (01)*0 and 0(10)*
   (ii) $(a \cup b)*a$ and $(b* \cup a*)*a$
   (iii) $((ab)* \cup c)*$ and $(a \cup b \cup c)*$

(b) Let α and β be any two strings over the alphabet {0, 1}. Show that

$$| \alpha\beta | = | \alpha | + | \beta |$$; where $| x |$ denotes the length of the string x.

Question 02

(a) Let L be the language defined by

   $L = \{w \in \{0, 1\}^* \mid w$ has exactly one occurrence of the substring 00$\}$

Design a deterministic finite automaton (DFA) to recognize L. Test your DFA on the following input strings.

   (i)   110011
   (ii) 101(00)*1
   (iii) 11

(b) Express in natural English the language accepted by the DFA given in Fig 2.1. Show that $\delta*(a(ab)*aa, q_3) = q_4$.
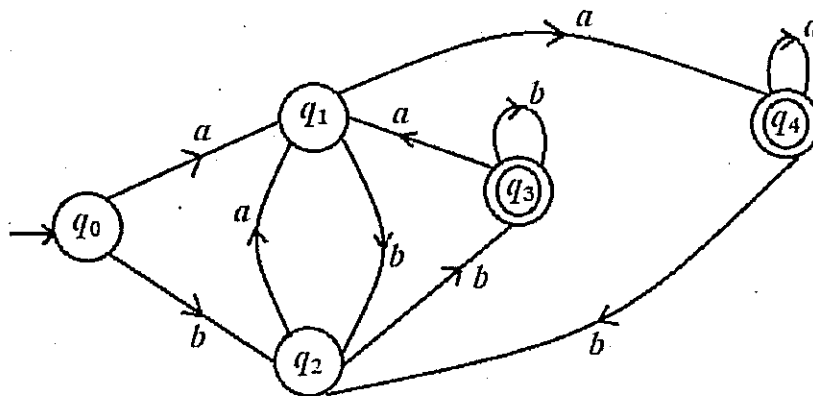

Fig 2.1

1

Question 03

(a) Design a nondeterministic finite automaton (NFA) to recognize the language generated by the expression $(a^m b a^n)^*$, where $m, n \geq 1$. Test your NFA for the following input strings.

    (i)   *aba*
    (ii) *aabaaba*
    (iii) *abab*

(b) Determine whether the string $abaa(aa)^*ba$ is accepted by the NFA you have designed in part (a). Justify your answer.