The Open University of Sri Lanka
The Department of Mathematics & Computer Science
CSU3275/PMU3293-Automata Theory
Closed Book Test 2009/2010
Duration: One and half hours

Date: 30/03/2010	Time: 4.oop.m.-5.30p.m.

Answer all questions.

01. Explain the similarities as well as the differences between deterministic finite automata and nondeterministic finite automata.

Construct a deterministic finite automaton accepting all the non-empty strings w, over the alphabet $\{a, b\}$, such that the sequence of symbols in w terminates with a symbol as soon as it encounters that the symbol is different from the starting symbol.

Test your automaton with each of the following strings.
(i) *aab*
(ii) *abab*
(iii) *bba*

02. Explain what is meant by "implementation of a Mealy machine".

Let M = (S, I, O, δ, β) be a Mealy machine, where $S = \{s, t\}$, $I = \{a, b, c\}$, O = {1, 2 }, and whose state transitions and outputs are defined in Table 2.

	$\delta(s, i)$			$\beta(s, i)$		
	a	*b*	*c*	*a*	*b*	*c*
s	*s*	*t*	*t*	2	1	1
t	*t*	*s*	*s*	2	2	2

Table 2

In the usual notation, obtain M_{code} and M_{circ} machines.

03. Let $M_1 = (S_1, I_1, O_1, \delta_1, \beta_1)$ and $M_2 = (S_2, I_2, O_2, \delta_2, \beta_2)$ be two Mealy machines. Define the parallel composite $M_1 \parallel M_2$ of M_1 and M_2.

Let M_1 and M_2 be the Mealy machines defined in Table 3.1 and Table 3.2 respectively.

	$\delta(s, i)$		$\beta(s, i)$	
	a	*b*	*a*	*b*
s	*s*	*t*	1	2
t	*t*	*s*	2	2

Table 3.1 – Mealy machine M_1

	$\delta(s, i)$			$\beta(s, i)$		
	a	*b*	*c*	*a*	*b*	*c*
s	*s*	*t*	*t*	2	1	1
t	*t*	*s*	*s*	2	2	2

Table 3.2 - Mealy machine M_2

Construct $M_1 \parallel M_2$.