The Open University of Sri Lanka
B.Sc. Degree Programme: Level 05
CSU3275/PMU3293 – Automata Theory
Department of Mathematics & Computer Science
The Closed Book Test – CBT (2010/2011)
Duration: One & Half hours ($1^1/_2$ Hours)

16 AUG 2011
The Open University of Sri Lanka

Date: 05.04.2011 **Time: 4.00pm – 5.30pm**

Answer ALL questions.

Question 01

(a) Define a nondeterministic finite automaton (NFA), and describe the operation of it. What is meant by a configuration of an NFA? You may use example(s) to support your answer.

(b) Let M be an NFA. Define $L(M)$, the language recognized by M. Consider the NFA represented by the directed graph shown in Fig 1.1. What is the language recognized by it?

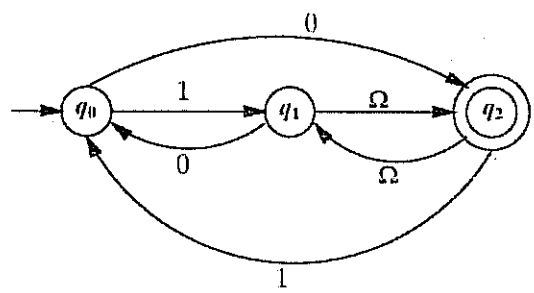

Fig 1.1

Question 02

Let M = (S, I, O, δ, β) be a Mealy machine. Define the functions δ^* and β^*. Prove that for all $s \in S, x \in I^*$ and $a \in I$,

(a) $\delta^*(s, xa) = \delta(\delta^*(s, x), a)$

(b) $\beta^*(s, xa) = \beta^*(s, x)\,\beta(\delta^*(s, x), a)$

Question 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 serial composite $M_1 \oplus_K M_2$ 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. The function κ is defined as $\kappa(1) = a$, $\kappa(2) = b$.

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

Table 3.1 – Mealy machine M_1

	$\delta(s, i)$		$\beta(s, i)$	
	a	b	a	b
s	s	t	1	0
t	t	s	0	0

Table 3.2 - Mealy machine M_2

Construct $M_1 \oplus_\kappa M_2$.

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