



The Open University of Sri Lanka
B.Sc. Degree Programme : Level 05
Closed Book Test- 2007/2008
CSU 3275/PMU 3293 - Automata Theory.
Duration: **One and Half Hours.**

Date: 11/04/2008

4.00pm – 5.30pm

Answer ALL Questions.

1. i) Construct the parallel composition between M1 and M2 below and identify the morphism between them.

M1

	States		Outputs	
	I1	I2	I1	I2
S1	S2	S1	P1	P2
S2	S1	S2	P1	P2

M2

	States		Outputs	
	1	2	1	2
a	a	b	1	0
b	b	b	1	0

- ii) What is the additional condition to composite the above two machines serially.
- 2.
- i) Suppose M1, M2, M3 are Mealy machines and that ϕ_1, ϕ_2 are homomorphism such that $\phi_1 : M1 \rightarrow M2$ and $\phi_2 : M2 \rightarrow M3$. Prove that $\phi_1 \cdot \phi_2 : M1 \rightarrow M3$ is a homomorphism, where $\phi_1 \cdot \phi_2 = (\alpha, \sigma, \theta)$ and $\alpha = \alpha_1 \cdot \alpha_2, \sigma = \sigma_1 \cdot \sigma_2, \theta = \theta_1 \cdot \theta_2$.
- ii) What do you mean by the term *two mealy machines are behaviorally equivalent*.
- 3.
- i) Let M1 and M2 be Mealy machines. Give the definitions for the parallel and serial composition between M1 and M2.
- ii) M1, M2 and M3 are any mealy machines, where $k1: O_1 \rightarrow I_2, k2: O_2 \rightarrow I_3$. Prove the following are true.
- a) $M1 \oplus_{k1}(M2 \oplus_{k2}M3) \approx (M1 \oplus_{k1}M2) \oplus_{k2}M3$
- b) $M1 \parallel (M2 \parallel M3) \approx (M1 \parallel M2) \parallel M3$

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