The Open University of Sri Lanka

B.Sc. Degree Programme :Level 05

Department of Mathematics and Computer Science

CSU3275/PMU3293/PME5293: AUTOMATA THEORY

Final Examination -2015/2016

Duration : Three Hours (3hours)

Date: 20th January 2017 **Time:1.30pm-4.30pm**

Answer Four Questions only

01. (a) Define a DFA (Deterministic Finite Automation) and describe the operation of it. Design a DFA to accept the strings over {0,1} consisting of an even number of 0s and an even number of 1s. Test your DFA with each of the following input strings. Clearly show the work you have done.

(i) 00
(ii) 10101
(iii) (00)*0110

(b) Define the language accepted by a DFA.

What is the language accepted by the DFA shown in Figure 1

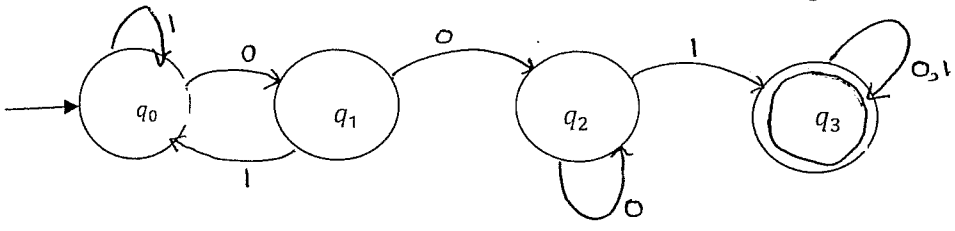

Figure 1

02 i (a) Define Mealy type sequential machine.

(b) Define Moor type sequential machine.

(c) Compare Mealy type sequential machines and Moor type sequential machines.

ii. Consider the flow table given below.

State	Inputs		Outputs
	0	1	
0	0	2	0
1	0	2	1
2	1	3	0
3	1	3	1

(a) What is the type of this machine?
(b) Draw the state graph for this machine.

iii. Draw a DFA to accept strings of 0's and 1's ending with the string 011.

03. (i) Compare the differences of states ,inputs, outputs and state/output transitions of two Mealy machines in parallel and serial composition.

(ii) The following is a transition of two Mealy machines M1 and M2.

M1

	a	b	c	a	b	c
Q0	Q1	Q3	Q2	0	0	1
Q1	Q3	Q2	Q3	1	1	0
Q2	Q3	Q3	Q0	0	0	1
Q3	Q3	Q3	Q3	1	1	1

M2

	0	1	0	1
00	00	10	0	0
01	00	10	1	1
10	01	11	0	0
11	01	11	1	1

a. If M1 is to be serially composite with M2, what would be the states of the composite machine?
b. Give the state and output transition tables of the composition machine.

04. (i) What do you mean by finite automata?

(ii) What are the special characteristics of Non-Deterministic Finite Automata?

(iii) Describe the difference between NDFA and DFA.

(iv) Construct a DFA that accepts strings over the alphabet {0,1} that have at least one 1 and an even number of 0's after the last 1.

05. Suppose M is any mealy machine and S is its set of states. Also suppose there is a partition π of S

(i) What do you mean by a partition π of S
(ii) Define a quotient machine by π
(iii) Define another mealy machine M'$\{S'I'O'\delta'\beta'\}$ and define π as Ker φ as the Kernel of φ, to be the partition $\{\alpha^{-1}(s), s\in S'\}$

(a) Show that Ker φ is SP
(b) Is Ker φ output consistent?

© If M→M' is a reduction show that $M' \approx \frac{M}{Ker}$

06. (i) What is meant by a 'Poset' ?

(ii) Prove that $(N^+, !)$ is a Poset where N^+ is the set of all positive , non zero, whole numbers and x y means that x divides y.

(iii)Suppose ((X),≤) is a Poset, where (X) denotes the set of partitions of a set X, then prove that for ∀x ∈ (X),

(a) $I_x \leq \pi$ and

(b)$\pi \leq T_x$ where I_x and T_X carry their usual meaning

(iv) Hence prove that I_x and T_x can be treated as lower and upper bounds for π.