Motilal Nehru National Institute of Technology
Department of Computer Science & Engineering
Mid Semester Examination

February 2018

Subject- Automata Theory (CS 1404), B. Tech (CS) - 4th Semester

Max. Marks: 20

Duration- 90 Minutes
Attempt all questions. Assume if something missing.

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1. Consider the given Non-Deterministic Finite Automata (NDFA) with two final states in Figure 1. Using the given NDFA, can you prove that for NDFA with two (or an arbitrary) number of final states, there is an equivalent NDFA with only one final state. Can you make a similar claim for DFA's? (4)

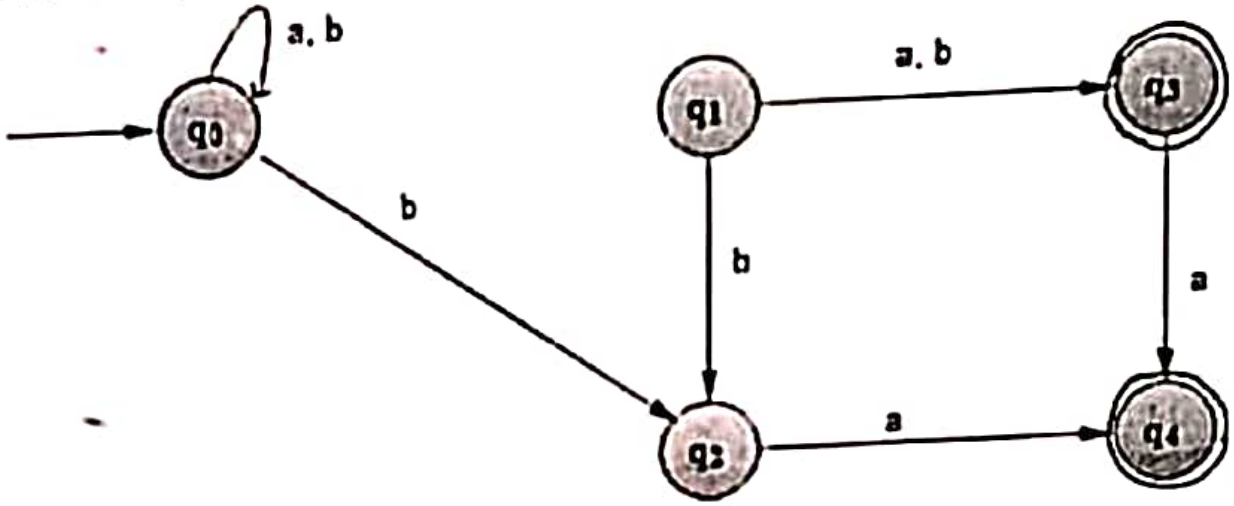

Figure 1: Non-Deterministic Finite Automata (NDFA) with two final states

2. Let L be the language

$$L = \{awa : w \in (a,b)^*\}$$

Give the answer for the followings (3 × 2 = 6):

a. Show that L^2 is regular. Draw the graphical representation of automata L^2 ?
b. Find the regular expression for the automata L^2 ?
c. Construct a minimum state Deterministic Finite Automata (DFA) equivalent to a DFA that accept language L^2.

3. Find Deterministic Finite Automata's (DFA's) for the following languages on $\Sigma = \{a,b\}$. (2 × 2 = 4)

a. $L = \{w : n_a(w) \bmod 2 = 0 \text{ or } n_b(w) \bmod 3 = 0\}$
b. $L = \{a^n b^m : n + m \text{ is even number}\}$

P.T.O

4. Construct a Moore machine equivalent to the Mealy machine M defined by Table 1. (4)

Present State	Next state			
	a=0		a=1	
	State	output	State	output
$\rightarrow q_1$	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

Table 1: Mealy Machine State Transitions

5. Prove $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*$. (2)