

CS305 Tutorial - 3

1. Construct a Mealy machine equivalent to the given Moore machine and also find language accepted by both machines.

Present state	Next state		Output
	$a=0$	$a=1$	
$q_0$	$q_1$	$q_2$	1
$q_1$	$q_3$	$q_2$	0
$q_2$	$q_2$	$q_1$	1
$q_3$	$q_0$	$q_3$	1

2. Construct a Moore machine equivalent to the given Mealy machine and also find language accepted by both machines.

Present state	Next state	
	$a=0$	$a=1$
$q_1$	$q_1$ O/P 1	$q_2$ O/P 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

3. Construct a Mealy machine which can output EVEN, ODD according as the total number of 1's encountered is even or odd. The input symbols are 0 and 1.

4. Find the minimal DFA's for languages below and also prove that it is minimal.

a)  $L = \{a^n b^m : n \geq 2, m \geq 1\}$

b)  $L = \{a^n : n \neq 2 \text{ and } n \neq 4\}$

c)  $L = \{a^n : n \bmod 3 = 0\} \cup \{a^n : n \bmod 5 = 1\}$

5. Prove or disprove the following conjecture.  
If  $M = (Q, \Sigma, S, q_0, F)$  is a minimal DFA for a regular language  $L$ , then  $\hat{M} = (Q, \Sigma, S, q_0, Q - F)$  is a minimal DFA for  $\bar{L}$ .
6. Let  $A/B = \{ w \mid wx \in A \text{ for some } x \in B \}$ . Show that if  $A$  is regular and  $B$  is any language, then  $A/B$  is regular.
7. Let  $B_n = \{ a^k \mid k \text{ is a multiple of } n \}$ . Show that for each  $n \geq 1$ , the language  $B_n$  is regular.

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