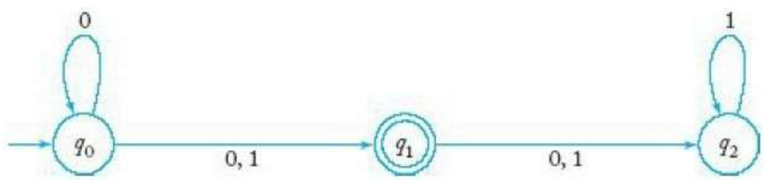
Academic Session 2025-2016

MC301 Theory of Computation

Assignment-I

1. Find a DFA that accepts all the strings on $\{0, 1\}$, except those containing the substring 001.
2. Construct a NDFA accepting the strings over $\{a,b\}$ ending in *aba*. Use it to construct a DFA accepting the same set of strings.
3. Construct a DFA for the NDFA represented by the transition diagram below:



4. Construct a Mealy machine which takes input *0, 1* and can output EVEN, ODD according as the total number of 0's encountered is even or odd.
5. Construct a Moore machine equivalent to Mealy machine defined by table below:

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

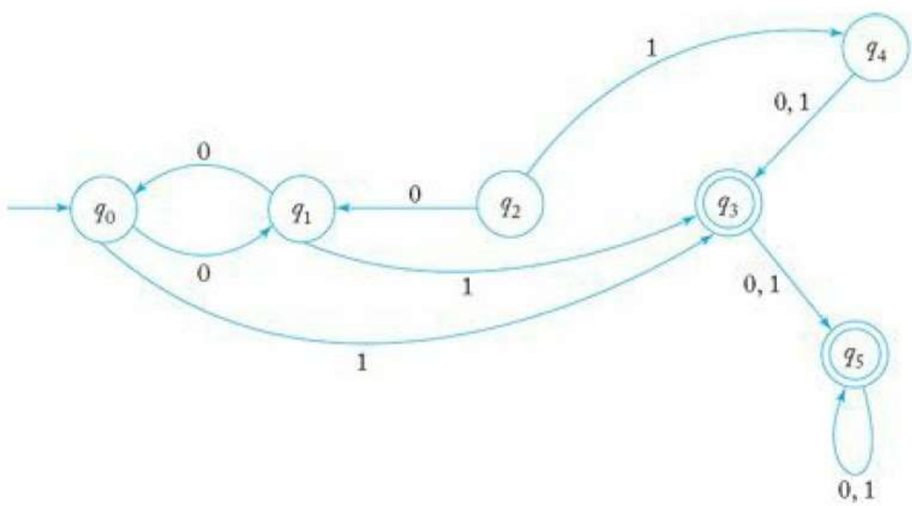
6. Construct a Mealy machine equivalent to Moore machine defined by table below:

Present State	Next State		Output
	a= 0	a= 1	
$\rightarrow q_0$	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

7. Construct a minimum state automata equivalent to automata given by the transition table below:

State	Input	
	a	b
$\to q_0$	q_0	q_3
q_1	q_2	q_5
q_2	q_3	q_4
q_3	q_0	q_5
q_4	q_0	q_6
q_5	q_1	q_4
q_6	q_1	q_3

8. Construct a minimum automaton for the automata below:



9. Find and explain one real-life application of a finite state automaton.

10. Minimize the DFA for strings where the third symbol from the end is ‘a’. How many states are in the minimal DFA?

11. Find the language generated by the grammar with production rules:

$$S \to 0S1/0A1, A \to 1A0/10$$

12. Construct a grammar, accepting $\{0^n1^m0^n | m, n \geq 1\} \cup \{0^n1^m2^m | m, n \geq 1\}$.

13. What is context-free grammar? Construct a context-free grammar to generate the set of all strings over $\{0, 1\}$ containing twice as many 0’s as 1’s.

14. What is regular grammar? Construct regular grammar to generate $\{(ab)^n | \ n \geq 1\}$.

15. Test whether $001100, 001010, 01010$ are in the language generated by the grammar with production rules:

$$S \to 0S1|0A|0|1B|1, A \to 0A|0, B \to 1B|1$$