

IIIT Vadodara
CS 305 (Autumn 2024-25)

Tutorial 1

Design Deterministic Finite Automata (DFA) with that accept the following Languages.

1. The language over $\Sigma = \{a\}$ of any odd number of a's.
2. The language over $\Sigma = \{a,b\}$ of length exactly three.
3. The language over $\Sigma = \{a,b\}$ of length at least three.
4. The language over $\Sigma = \{a,b\}$ of length at most three.
5. The language over $\Sigma = \{a,b\}$ which starting with a and ending with b.
6. Let $L = \{w|n_a(w)\bmod 4 = 3\}$ (where $n_a(w)$ represents number of a's in string w) over $\Sigma = \{a,b\}$.
7. The language over $\Sigma = \{a,b\}$ of any even number of a's and any odd number of b's.
8. The language over $\Sigma = \{a,b\}$, where number of a's are even and number of b's are divisible by 3.
9. The language over $\Sigma = \{0,1\}$ whose decimal equivalent is an odd integer.
10. The language over $\Sigma = \{0,1\}$ whose decimal equivalent is divisible by 3.
11. Design Deterministic Finite Automata (DFA) with that accept the following set of strings over $\Sigma = \{a,b\}$
 - a) Containing at least one **a** or at least two **b**'s.
 - b) Containing at least one **a** and at most one **b**.
 - c) Containing even number of **a**'s and no adjacent **a**'s.
 - d) Containing alternating **a**'s and **b**'s.
 - e) Containing even length strings where second symbol is **b**.
 - f) Containing **aba** as a substring.
 - g) Set of all strings other than **a** and **bb**.
 - h) Containing at least two **a**'s.
 - i) Set of all strings such that no two **b**'s are adjacent.
12. Design a DFA for the language $L = \{a^n b | n \geq 0\}$ over $\Sigma = \{a,b\}$. Hence, design DFA for language
 - a) accepting L^2
 - b) accepting $L^2 - L$.