Foundation of Computer Science (CS60001)
Tutorial - 01

3^{rd} August, 2011

1. Construct a DFA that will accept the following languages over the alphabet {0, 1}.
   (a) {ω | ω is any string except 11 & 111}.
   (b) {ω | ω has an even number of 0's & one or two 1's}
2. Construct a NFA that will accept the language $1^*(001^+)^*$ over the alphabet {0, 1} with three states.
3. Give an NFA recognizing $(01 \cup 001 \cup 010)^*$.
4. Give the regular expression for the following languages:
   (a) All strings of 0's and 1's beginning with 1 and not having two consecutive 0's.
   (b) All strings of 0's and 1's that do not have two consecutive 0's.
   (c) The set of all strings of 0's and 1's with at most one pair of consecutive 0's and at most one pair of consecutive 1's.
   (d) The set of all strings in which every pair of adjacent 0's appears before any pair of adjacent 1's.
   (e) The set of all strings not containing 101 as a substring.
5. Determine whether the following languages are $Regular$ or $Non - Regular$.
   (a) Let A = $\{1^k y \mid y \in \{0, 1\}^*$ and y contains at least k 1s for $k \geq 1\}$.
   (b) Let B = $\{1^k y \mid y \in \{0, 1\}^*$ and y contains at most k 1s for $k \geq 1\}$.
6. Consider the language C = $\{a^i b^j c^k \mid i, j, k \geq 0$ and $if\ i = 1$ the $j = k\}$. Show that C is $Not\ Regular$.
7. Let D be the language of all valid delimited comment strings. A member of D must begin with /# and end with #/ but have no intervening #/. For simplicity, we will say that the comments themselves are written with only the symbols a and b; hence the alphabet of D is Σ = {a, b, /, #}.
   (a) Give a DFA that recognizes D.
   (b) Give a regular expression that generates D.