

CS3231

Tutorial 1

- Let $\Sigma = \{a, b, c\}$.
Let $L_1 = \{a^n b^m \mid n, m \geq 0\}$, $L_2 = \{b^m c^n \mid n, m \geq 0\}$, $L_3 = \{a^m b^n c^r \mid n, m, r \geq 0\}$.
 - What is $L_1 \cap L_2$?
 - What is $L_1 \cup L_2$?
 - What is L_3^* ?
 - Is $L_1 \cdot L_2 = L_3$?
 - Is $L_1 \cap L_2 = L_3$?
- Show by induction that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$.
- For a particular alphabet set Σ , how many strings of length n are there in Σ^* ? How many strings in Σ^* have length $\leq n$?
 - Suppose w and u are strings. Find an expression for length of $(w \cdot u)^{i^2+i \cdot j^3} \cdot u^i \cdot w^j$, in terms of $i, j, |w|, |u|$.
 - Find all the substrings of the string "UNIVERSITY".
- Suppose A, B_i are languages over Σ .
Show that $A \cdot (\bigcup_{i=1}^{\infty} B_i) = \bigcup_{i=1}^{\infty} (A \cdot B_i)$.
- Show that $(A^*)^+ = (A^+)^* = A^*$.
- Suppose $\Sigma = \{0, 1\}$.
 - Let $L = \{w \mid \text{number of 0's in } w \text{ is of form } 3i + 2, \text{ for some natural number } i\}$. Give a DFA for L .
 - Let $L = \{w \mid w \text{ has } 01001 \text{ as a substring}\}$. Give a DFA for L .
- What is the language accepted by the following DFA.