

11 Trees

11.1 Introduction to Trees

1. A tree is a connected graph without cycles (or without simple circuits).
2. A rooted tree is a tree in which one vertex has been designated as the root and every edge is directed away from the root (undirected, yet understood that edges point away from the root capturing the parent-child relationship):
 - The parent of v is the unique vertex u such that there is a directed edge from u to v (for each vertex, its parent is unique).
 - When u is the parent of v , v is called a child of u .
 - Vertices with the same parent are called siblings.
 - The ancestors of a vertex is the root and the vertices in the path from the root (excluding the vertex itself)
 - The descendants of a vertex v are those vertices that have v as an ancestor
 - A vertex of a rooted tree is called a leaf if it has no children.
 - Vertices that have children are called internal vertices.
 - The height of a rooted tree is the maximum of the levels of vertices (i.e. the length of the longest path from the root to all vertices)
3. A m -ary tree is rooted tree whose internal vertex has no more than m children.
4. The tree is a full m -ary tree if every internal vertex has exactly m children (if $m = 2$, it is called a binary tree).