Tree: a connected undirected graph with no simple circuits

Forest: the property that each of their connected component is a tree

Tree Theorem: An undirected graph is a tree if and only if there is a unique simple path between any two of its vertices.

Root: A vertex of a tree.

rooted tree: a tree in which one vertex has been designated as the rot and every edge is directed away from the root.

Parent: If v is a vertex in T other than the root, the parent of v is the unique vertex u such that there is a directed edge from u to v.

Child: Vertices are u and v. When u is the parent of v, v is called a child of u.

Siblings: Vertices with the same parent are called siblings.

Ancestors: The ancestors of a vertex other than the root are the vertices in the path from the root to this vertex.

Descendants : The descendants of a vertex v are those vertices that have v as an ancestor.

Leaf: A vertex of a rooted tree if it has no children.

internal vertices: Vertices that have children.

m-ary tree: When every internal vertex has no more than m children.

full m-ary tree: When every internal vertex has exactly m children.

ordered rooted tree: a rooted tree where the children of each internal vertex are ordered

binary tree: if an internal vertex has two children

left child: First child of a binary tree

right child: Second child of a binary tree

left subtree: tree rooted at the left child

right subtree: tree rooted at the right child

Tree vertices theorem: A tree with n vertices has n-1 edges

full m-ary tree vertices theorem: A full m-ary tree with i internal vertices contains n = mi + 1 vertices.

Full m-ary tree theorem: A full m-ary tree with (i ) n vertices has i = (n − 1)/m internal vertices and l = [(m − 1)n + 1]/m leaves, (ii ) i internal vertices has n = mi + 1 vertices and l = (m − 1)i + 1 leaves, (iii ) l leaves has n = (ml − 1)/(m − 1) vertices and i = (l − 1)/(m − 1) internal vertices.

balanced tree: A rooted m-ary tree of height h is balanced if all leaves are at levels h or h − 1.

Balanced tree theorem: There are at most mh leaves in an m-ary tree of height h.

binary search tree: binary tree in which each child of a vertex is designated as a right or left child, no vertex has more than one right child or left child, and each vertex is labeled with a key, which is one of the items.

decision tree: A rooted tree in which each internal vertex corresponds to a decision, with a subtree at these vertices for each possible outcome of the decision.

binary comparison theorem: A sorting algorithm based on binary comparisons requires at least upper bound(log n!) comparisons.

average comparison theorem: The average number of comparisons used by a sorting algorithm to sort n elements based on binary comparisons is (omega)(n log n).

Huffman coding: an algorithm that takes as input the frequencies (which are the probabilities of occurrences) of symbols in a string and produces as output a prefix code that encodes the string using the fewest possible bits, among all possible binary prefix codes for these symbols.

nim game: at the start of a game there are a number of piles of stones. Two players take turns making moves; a legal move consists of removing one or more stones from one of the piles, without removing all the stones left.A player without a legal move loses.

minmax strategy: The strategy where the first player moves to a position represented by a child with maximum value and the second player moves to a position of a child with minimum value

minmax theorem: The value of a vertex of a game tree tells us the payoff to the first player if both players follow the minmax strategy and play starts from the position represented by this vertex

Universal Address System: a vertex v at level n, for n ≥ 1, is labeled x1.x2. . . . .xn, where the  
unique path from the root to v goes through the x1st vertex at level 1, the x2nd vertex at level 2,  
and so on.

Traversal algorithms: Procedures for systematically visiting every vertex of an ordered rooted tree.

Infix form: To make such expressions unambiguous it is necessary to include parentheses in the in order traversal whenever we encounter an operation.

Prefix form: obtain the prefix form of an expression when we traverse its rooted tree in preorder.

Polish notation: expressions written in prefix form.

postfix form: We obtain the postfix form of an expression by traversing its binary tree in postorder.

Reverse polish notation - expressions written in postfix form.

Spanning tree: Let G be a simple graph. A spanning tree of G is a subgraph of G that is a tree containing every vertex of G.

Backtracking: depth first search.

Breath-first search: producing a spanning tree of using a simple graph. a rooted tree will be constructed, and the underlying undirected graph of this rooted tree forms the spanning tree.

Minimum spanning tree: a spanning tree so that the sum of the weights of the edges of the tree is minimized.

Prim’s algorithm: Begin by choosing any edge with smallest weight, putting it into the spanning tree. Successively add to the tree edges of minimum weight that are incident to a vertex already in the tree, never forming a simple circuit with those edges already in the tree. Stop when n − 1 edges have been added.

Kruskal’s algorithm: choose an edge in the graph with minimum weight. Successively add edges with minimum weight that do not form a simple circuit with those edges already chosen. Stop after n - 1 edges have been selected.