

Assignment Evaluation

Advanced Data Structures and Algorithms

2nd December 2021

Total : 100 marks

- *Note: Codes can be used wherever necessary along with algorithms.**
- *Note: Only one student from the group needs to submit the assignment.**
- *It is to be submitted before 10th December 2021 (11:59 PM)**
- *Attempt any 2 Questions from Question 1 to 3 [15 marks each].**
- *Attempt any 2 Questions from Question 4 to 6 [20 marks each].**
- *Question 7 and 8 are compulsory. [15 marks each]**

1. Represent the following sets by using BST: $A=\{7,2,4,9,15,6,11\}$, $B=\{12,3,16,1,5,8,10\}$. Merge both the sets into new set C (test if merge operation is possible). Write the procedure to display C.
2. Represent a graph G as a combination of two sets V, E. If only these sets are used, how can DFS be implemented? Explain what additional information besides V and E may be required.
3. Store following topological order of elements using appropriate data structure: (a, b), (c, d, e), (f, g), h. The elements in () may be visited in any order, e.g., a, b or b, a etc.
4. Consider a set of elements to be partitioned into classes such that no element shares two classes. The procedure of partitioning can be done on the basis of some property of the elements which may differentiate them from one another. Let p_1 be the property to divide the set into 2 parts such that all the elements having property p_1 are grouped into one class and all others into second class. The second class can be partitioned into two classes on the basis of some other property p_2 and so on. The partitioning will generate a binary tree and such a decision based tree is called a decision tree. Write the procedure for generating a decision tree from a given set.
5. A transitive reduction of a directed graph G (V, E) is any graph G' with the same vertices but with minimum edges such that the transitive closure of G and G' are the same. How can G' be obtained, if G is given? Write the procedure.

6. Write the algorithm to find the longest path in a Graph and Estimate the complexity of the algorithm.
7. Implement a trie to accept all three letter strings. What is the cost to add an element in this structure? Estimate it.
8. Traverse a general tree (rooted) in all siblings together (bfs) manner and write the procedure for it. Discuss the space complexity of tree representation first.