Date : 11.10.2019 Time: 2 ½ Hours Total Marks: 75

N.B. (1) All questions are compulsory.
(2) Figures to the right indicate marks for respective sub questions.
(3) Use of **Non-programmable** calculators is **allowed.**
(4) Draw **neat labeled diagrams** wherever **necessary.**
(5) Symbols used have their usual meaning

Q.1) Attempt **any THREE** of the following. (15)
a) What is data structure? Explain different categories of data structure
b) What is an algorithm? What are the characteristics of an algorithm?
c) Write an algorithm for searching the element in an array
d) What is time and space complexity? Explain Big O and Big Theta notation
e) Write an algorithm for sorting the elements of an array.
f) Write an algorithm for merging two arrays.

Q.2) Attempt **any THREE** of the following. (15)
a) What is linked list? Write and explain an algorithm to insert an element at the beginning of the singly linked list
b) Explain the structure of double linked list
c) Write a short note on header linked list.
d) Write an algorithm for reversing the single linked list
e) Explain algorithmically the traversal of single linked list.
f) Write and explain an algorithm to delete an element at the beginning of the singly linked list

Q.3) Attempt **any THREE** of the following. (15)
a) Define stack. Write an algorithm for PUSH operation.
b) Explain the working mechanism of Circular queue
c) Write the steps for converting infix to postfix. And Convert the following expression into postfix form: (A+B)*C-(D-E)*(F+G)
d) Write a short note on double ended queue.
e) Define queue. How queue is represented in memory using linked list?
f) Write an algorithm for Deque.

Q.4) Attempt **any THREE** of the following. (15)
a) Reconstruct the binary tree who's in-order and pre-order traversals are:
In-order Traversal: d b f e a g c l j h
Pre-order Traversal: d f e b g l j h c a
b) Make a binary search tree by inserting the following number in sequence
50 15 62 5 20 58 91 3 8 3 7 60 24
c) Draw max and min heap with the following element
25 32 17 7 15 50 6 30
d) Explain inorder and preorder traversal of the tree.

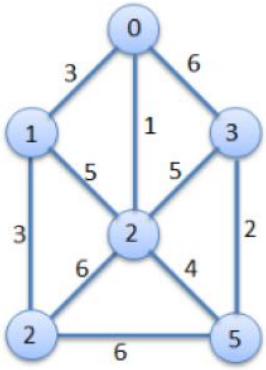
e) Construct the Huffman code with the help of following frequencies

P	Q	R	S	T	U
45	13	12	16	9	5

f) What is AVL tree? How balancing is done in AVL tree? Explain with example

Q.5) Attempt **any THREE** of the following. (15)

a) What is Hashing? Explain modulo division hashing with example.
b) What is collision? Explain how it is resolve.
c) What is Graph? Explain directed and undirected graph.
d) Find the minimum spanning tree for the following graph using Prim's algorithm and the source vertex 'S'.



e) Explain Warshall's algorithm of finding path matrix of a graph.
f) Define the following terms:
   1. Graph
   2. Directed Graph
   3. Weighted Graph
   4. Simple Graph
   5. Edge

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