Thapar Institute of Engineering and Technology (TIET), Patiala
Department of Computer Science & Engineering (CSED)
AUXILIARY EXAMINATION

B. E. (Second Year): Semester- III (COE)	Course Code: UCS301 Course Name: Data Structures
February 25, 2023	Saturday, 5:30PM – 8:30PM
Time: 3.00Hrs, Max. Marks: 100	Name of Faculty: Dr. Sumana Maiti

Note: Attempt all questions in sequence. Assume any missing data. Please be precise and concise while writing.

Q1. (a) A BST contains the numbers 1, 2, 3, 4, 5, 6, 7, 8. When the tree is traversed in preorder and the values in each node printed out, the sequence of values obtained is 5, 3, 1, 2, 4, 6, 8, 7. Draw the tree. If the tree is traversed in post order, what will be the sequence? (4+4)

Q1. (b) Find the maximum height of any AVL tree with 7 nodes. Assume that the height of a tree with a single node is 0 (2)

Q2. (a) An array A[1 to 10][1 to 15] is stored in row major order in memory. Base address is 100. Size of each element is considered as 1 byte. Find the address of the element A[i][j]. (7)

Q2. (b) What is the time complexity of linear search and binary search in an array with n number of elements. (1+2)

Q3. (a) Define max heap with an example. (3)

Q3. (b) 32, 15, 20, 30, 12, 25, 16. (7)

If the above elements are inserted like a max heap, draw the final tree.

Q4. (a) If a hash table size is 11 (indices are from 0 to 10). The hash function is defined as h(k) = k mod 11. If we apply linear probing, then find out the indices of the following records in the hash table. Assume the elements are inserted in sequence. (10)

43, 36, 92, 87, 11, 4, 71, 13, 14

Q5. (a) Find out the result of the following postfix equation. (5)

3 2 1 * +

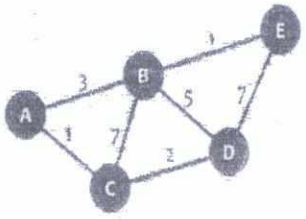
Q5.(b) Convert the following infix equation into postfix equation. (5)

a * b + (c - d)

Q6. (a) Construct an AVL tree with the following elements in sequence. (10)

50, 20, 60, 10, 8, 15, 32, 46, 11, 48

Q7. (a) Find the shortest path from node c to all the other nodes (A, B, D, E) in the figure using Dijkstra algorithm. (8)



Q7. (b) Define Spanning tree with a suitable example. (2)

Q8. (a) Suppose a stack implementation supports in addition to push and pop an operation reverses the order of the elements on the stack. (10)

Show how to implement 'ENQUEUE' using a single operation and 'DEQUEUE' using a sequence of three operations.

Q9. (a) $F1 = 2^n$, $F2 = n^{(3/2)}$, $F3 = n \log n$, $F4 = n^{\log n}$ (10)

Arrange the above functions in ascending order of the time complexity.

Q10. (a) State the difference between Binary tree and Binary search tree with examples (4)

Q10. (b) Define complete binary tree with proper examples. (2)

Q10. (c) If all the binary trees with 3 nodes A, B, C are given, which have preorder A B C and postorder C B A. How many binary trees are possible? Draw each of the trees. (4)