

B.Sc. (Honours) Semester-II Examination 2017
Computer Science
Course : BCSC-21
(Data Structures)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Attempt Question No. **1** and **any four** from the rest

1. (a) Prove that $f(n) = 2n - \frac{1}{n}$ is $\omega(n)$.
(b) Explain, how a rooted ordered tree can be efficiently represented.
(c) Define the ADT dictionary and priority queue.
(d) Consider a chord (u, v) in the DFS tree T of an undirected graph G. Prove that u is an ancestor or descendent of v in T. 4×2=8
 2. (a) Define the ADT polynomial.
(b) Explain how a polynomial can be represented using an array, and a linked list. Also discuss the advantages and disadvantages of these representations.
(c) Explain, using a suitable example, how two polynomials, represented as linked lists, can be added. 1+(2+2)+3=8
 3. (a) Define the ADT list.
(b) How can a linked list be defined in C for its dynamic implementation?
(c) Write a function in C for inserting a node x after a node pointed by a pointer p.
(d) Write a function in C for deleting a node after the node pointed by a pointer p. 1+2+2.5+2.5=8
 4. (a) Define a binary tree.
(b) Present an iterative function in C to compute the inorder traversal of a binary tree.
(c) Present a function in C, to insert a node as right-child of a node in a threaded binary tree. 1+3+4=8
 5. (a) Define a binary search tree.
(b) The inorder traversal of a binary search tree produces a sorted sequence – Explain with a suitable example.
(c) Write a function in C to insert a node in a binary search tree.
(d) What is the worst case time complexity of the above insertion algorithm? 2+2+3+1=8
 6. (a) Let n be the number of nodes in an AVL tree. Prove that the height of this tree is at most $2\log n$.
(b) Explain the four primitive actions required to be taken to maintain small height of an AVL tree during the insertion of a node in the tree. 4+4=8
 7. (a) Explain, using a suitable example, how a graph can be represented using adjacency matrix and adjacency list representations. Also explain the merits and the demerits of these representations.
(b) Write a function in C to obtain a depth first forest of a graph. 3+5=8
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