B. E. INSTRUMENTATION & ELECTRONICS ENGINEERING SECOND YEAR SECOND SEMESTER - 2022

DATA STRUCTURE, ALGORITHM & OOPs

TIME: 3 Hours

FULL MARKS: 100

Answer all questions

CO1:

1. Differentiate between Linear and Non-linear data structures. Give two examples of each. [3+2]
2. What are the characteristics of an algorithm? What do you understand by complexity of an algorithm? [2+2]
3. Suppose one 2-D array is initialized as int a [5] [7]; Base address is 4000. Find the location of the element a [2] [4] in row major form and column major form. [3]
4. Explain any two non-primitive data structures. [4]
5. What are the advantages and disadvantages of using linked list over array? [4]

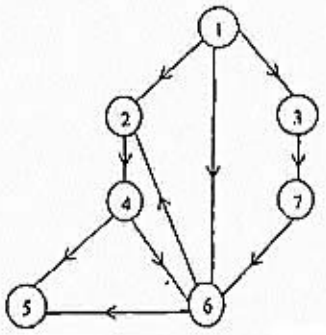
CO2:

6. The in-order and post-order traversal sequence of nodes in a binary tree are given below: [5]

   Post-order: I E J F C G K L H D B A
   In-order: E I C F J B G D K H L A

   Construct the tree.

7. Write an algorithm to insert an element in the middle of a linked list. [5]
8. For the following graph, find the BFS and DFS traversal with proper algorithm. [5]



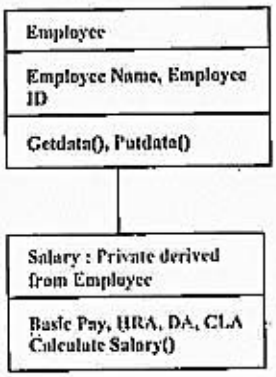
9. Insert the following keys in the order given below to build them into an AVL-tree. 12, 11, 13, 10, 09, 15, 14, 18, 7, 6, 5, 4. Clearly mention the different rotations used and balance factor of each node. [5]

CO3:

10. Define sorting. Write the pseudocode for Merge sort implementation. What is its time complexity? [1+3+1]
11. Explain selection sort with an example. Give its complexity. [5]
12. Write and explain Bubble sorting algorithm with an example [4]
13. What is searching? Explain Binary search algorithm with example and also find its time complexity. [1+4+1]

CO4:

14. State the important features of object oriented programming. Compare object oriented programming with procedure oriented programming. [3+3]
15. Write the significance of static data members in C++? [3]
16. Define classes to appropriately represent class hierarchy as shown in below figure. Use constructors for both classes and display Salary for a particular employee. [6]



17. Write a C++ program to illustrate the concept of friend function. [5]

CO5:

18. Explain the visibility of base class members for the access specifiers: private, protected and public while creating the derived class and also explain the syntax for creating derived class. [5]
19. Explain with suitable examples, multi-level inheritance and multiple inheritance. [4]
20. Define pure virtual functions. Write a C++ program to illustrate pure virtual functions. [1+4]
21. What do you mean by operator overloading in C++? Write a C++ program to add two complex numbers by overloading binary (+) operator. [2+4]

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CO1: Understand data structures their advantages, drawbacks its types and analyze algorithms.
CO2: Explain, apply and **analyze** different types of linear and non-linear data structures.
CO3: Explain and **illustrate** different techniques of searching and sorting and differentiate them in terms of performance.
CO4: Explain, illustrate and **recognize** the basic features of classes, objects and encapsulation mechanisms.
CO5: Illustrate the extended features of OOPs (Inheritance, Polymorphism, Operator overloading) and **apply** them to solve practical problems.