

Registration Number:

Date & session:

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**ST JOSEPH’S UNIVERSITY, BENGALURU -27**

**BCA – 2nd SEMESTER**

**SEMESTER EXAMINATION: APRIL 2024**

**(Examination conducted in May / June 2024)**

**CA 2121: Data Structures Using C**

**(For current batch students only)**

**Time: 2 Hours Max Marks: 60**

**This paper contains TWO printed pages and THREE parts**

**PART A**

**Answer any five of the following questions (2\*5=10)**

**1.** What do you mean by Data Structures? With examples show how linear data structures differ from non-linear data structures.

**2.** Write a function subprogram in C to return 1 if the stack is empty or else return 0.

**3.** Explain the meaning of Big-O notation to assess the complexity of an algorithm.

**4.** Given the following list of numbers create a BINARY SEARCH TREE**.**

**65, 83, 20, 30, 12, 80, 60, 90, 69,15, 27, 62**

**5.** Write a function subprogram in C to display the contents of a linked list.

**6.** Write a function subprogram to remove an element from a circular queue.

**PART B**

**Answer any five of the following questions (4\*5=20)**

**7.** Write a program in C to input some numbers into an array and sort them using **INSERTION SORT** technique.

**8.** Using a STACK show the conversion of the following INFIX expressions into POSTFIX expression.

**A + ((C – D \*E)\*F) /( G - H)^2**

**9.** Given the recurrence formula below, calculate the complexity of the algorithm represented by the recurrence formula.  
 T(n) = T(N-1) + 1 for n>0  
 T(0) = 1

**10.** Write a function subprogram in C using a stack to convert a decimal number into its BINARY EQUIVALENT.

**11.** What is a **SPARSE MATRIX**? With an example show how it can be implemented using a linked list.

**12.** Given the precedence of operators [ “(“ :1, “)”2, +,-:3, \*,/: 4, ^: 5 ] .Write a function sub program to return the precedence of a given operator.

**13.** Give an algorithm to insert a node into an ordered DOUBLY LINKED LIST**.**

**PART C**

**Answer any three of the following questions (3\*10=30)**

**14. a.** Given the PREORDER TRAVERSAL of a binary search tree, create the binary search tree. Show the steps involved.

E, C, A, B , D, H, F, G, I

**b.** Declare a data type to represent node of a Queue. Write a function Dequeue() to delete a number from the Queue ( Front and Rear are global pointers representing the beginning and the end of the queue )

[4+6]

**15. a.** Write a program in C to evaluate a postfix expression.

**b.** With the help of a tabular column show how the following postfix expression is evaluated using a stack.  
 **5, 10, 5, -, 2, ^, 8, 3, -, 2, \*, /, +** [7+3]

**16. a.** Write the preorder traversal for the following tree

A diagram of a root system

Description automatically generated

**b.** Create a new data type to represent the node of a **BST** known as **TREENODE** having integer data item and two links to right and left sub trees. Write function subprograms to **insert** a number into the BST, and recursive functions to do **INORDER** traversal.

[4+6]

**17.a.** Construct a tree from the given traversals

Inorder Traversal: **D,B,A,G,E,H,C,F**

Preorder Traversal: **A,B,D,C,E,G,H,F**

**b.** Write a function program to search for a given number using BINARY search. Let it return 1 if the number is found or else return 0. What is the condition for using binary search? Which searching method is efficient? Linear or Binary? Why? [5+5]

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