Question Paper

Exam Date & Time: 05-Dec-2023 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH. DEGREE EXAMINATIONS - NOVEMBER / DECEMBER 2023 SUBJECT: CSE 2122- DATA STRUCTURES

Marks: 50

Duration: 180 mins.

Answer all the questions.

1A)	 Solve the problem of searching for an element in a list of numbers and finding the sum of all the numbers in a list of numbers using a C program. Create the list of numbers (1D array) using dynamic memory allocation functions in the main function. Write a recursive function called BinSearch which accepts two integer pointers and an integer which is the element to be searched, to search whether the element exists in the array or not. Write a recursive function AddArray which accepts an integer pointer and an integer to find the sum of the elements in the array. Test the above two functions from the main function. 	(4)
1B)	Define a Student structure having members name (which is char array), cgpa (which is float type), birthdate (which is a pointer to a structure date having 3 integer members for storing day, month, and year), admission_date (which is pointer to a structure date having 3 integer members for storing day, month, and year), address (which is character array). Write a C program to Create an array of structure of type Student to store details of 'n' students. Read the details of 'n' students and display the same in the main function. Define a function Age which takes a pointer to the structure Student and calculates the age of the student during admission time and displays the same.Test this function from the main.	(4)
1C)	One of the applications of a stack is to convert prefix expressions to postfix expressions. Determine the steps involved to demonstrate the use of stack in converting prefix to postfix expression.	(2)
2A)	A set can be represented by a dynamic array of elements, where no repetition is permitted. Write C functions to perform the following operations on sets of integer valued elements. i) int* BuildSet(int n): Read n number of elements and store them in a set ii) int SearchSet(int* A, int x): Search the set A to find if an element x is in it. iii) Given two sets, compute the following. int* Union (int *A, int *B): To return the union of two sets A and B The main program should call the functions. All results should be stored in their resultant sets and then display the results	(4)
2B)	 Design a simple task priority queue in C without using any specific data structure. Each task has a priority, and the goal is to execute tasks in order of their priority, with higher priority tasks being executed first. a) Define a structure Task with attributes priority (an integer) and description (a string). b) Implement functions to manage the following. i) void enqueueTaskWithPriority(int priority, const char *description): Adds a task with a given priority to the priority queue. ii) void executeHighestPriorityTask() : Executes and removes the task with the highest priority from the queue. 	(3)
2C)	Consider the following structure definition of a doubly linked list. Each node of the list consists of a character. Collection of all the nodes represents a word.	(3)

```
struct Node
{
    char data;
    struct Node *next;
    struct Node *prev;
};
    struct Node *start = NULL;
```

Write a function palindrome which checks whether the word formed for the doubly linked list represents a palindrome or not. The function is passed with address of leftmost node in the list. Also write the function to display the word represented by the list.

i) Write a function to find the largest number node in a binary tree. (4)
ii) Find the height of the given tree and show the left child-right sibling representation of the following tree.



Perform the following operations on the given tree and write the preorder and post-order traversal of (4) the final tree.

i) Insert 46

3A)

3B)

3C)

4A)

- ii) Insert 28
- iii) Delete 26
- iv) Delete 47
- v) Delete 30
- vi) Insert 49



Write a function to insert an item at the end of Circular Singly Linked List with header node. Use the (2) following function prototype:

Nodeptr InsertLast (Nodeptr head, int x); where head represents the header node and x is the item to be inserted.

Suppose the threaded binary tree is given



(4)

Insert the elements 4, 9, 11, 13, 16, and 2 in that tree and show all the steps in pictorial form. Point out one reason for using the threaded binary tree. (3+1 = 4 marks)

4B)

i) Traverse the below graph G using the BFS algorithm and examine the new traversal path. (4)



ii) Traverse the below graph G using DFS algorithm and examine the new traversal path.



(2+2 = 4

Suggest a suitable data structure to handle I/O operations in the computer systems and implement (2) the code.

Note- While interrupt operations are not allowed.

5A) i) Degree Two Tree Representation



ii) Deletion in the given binary tree 15,30.



(1+1¹/₂+1¹/₂ = 4 marks)

Construct a binary tree in pictorial form for the given

(4)

4C)

i) In-order: 9,11,22,23,30,40,45,48,50 Pre-order: 40,30,22,11,9,23,45,48,50

ii) In-order: 46,75,77,78,79,80,82,85,90,95
Post-order: 46,77,79,78,75,82,90,95,85,80
(2+2 = 4 marks)

Represent the following graph using an adjacency matrix and Prepare the in-degree and out-degree (2) of each vertex.



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