Question Paper

Exam Date & Time: 11-Jul-2023 (02:30 PM - 05:30 PM)

DEPARTMENT OF I&CT, MIT, MAHE, MANIPAL
FOURTH SEMESTER B.TECH MAKE-UP EXAMINATIONS, JULY 2023
FUNDAMENTALS OF DATA STRUCTURES AND ALGORITHMS [ICT 4303]

Marks: 50 **Duration: 180 mins.**

Instructions to Candidates: **Answer ALL questions** Missing data may be suitably assumed

1)		Consider a 2D integer matrix, named MAT, of order M X N. Read the values of M, N and matrix MAT from user. Write complete C++ code to sort each row of the matrix separately using selection sort technique. The result of sorting must be saved in same matrix MAT. Example: if MAT is {{4,3,2,6,1},{314,30,212,61,11},{24,23,21,6,12},{141,3,99,26,1}} then MAT should become {{1,2,3,4,6},{11,30,61,212,314},{6,12,21,23,24},{1,3,26,99,141}}	(5)
	A)		
	B)	Write a C++ function to print duplicate characters along with its frequency for the string entered by the user. Examples: List of duplicate characters in String 'Programming' g : 2 r : 2 m : 2 List of duplicate characters in String 'Combination' n : 2, o : 2, i : 2 List of duplicate characters in String 'Java': a: 2	(3)
	C)	A program reads in 500 integers in the range [0, 100] representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for the program to store the frequencies? Also, depict the way to store the frequency using C++.	(2)
2)		Write a complete C++ program to reverse each number of an array using stack.	(5)
	A)		
	B)	Write a C++ program to perform the following operations on Doubly Linked List (DLL). i. Create a DLL by adding node at the end of the list to store integer values ii. Display only the even numbers stored in the list.	(3)
	C)	Write output of the following error-free code along with proper justification:- int main() { int j,arr[] = {12, 34, 56, 78, 90}; int *ptr;	(2)

```
ptr = arr;

for(j=0; j< 5; j++)

cout< < *ptr< < " ";

return(1);

}
```

3) The student details of a section is stored as a singly linked list. The details are regno, name, sem and cgpa. Create the node structure for this. Write functions to do the following: (5)

A)

i. Create a master singly linked list(SLL) of students

ii. Create a linked list containing the students whose cgpa is less than 6 from the master SLL(The master SLL containing the details of all the students is passed as the parameter to the function).

B) What do you mean by Time complexity? Find the time complexity of the below given function. (3)

```
int function1(int arr[], int size, int key) {

int index;

// loop for traversing the array from 0 to the number of elements-1

for (index = 0; index < size; index++){

if (arr[index] == key) // comparing each element with the key element

return index;}

}
```

C) Compare and contrast the linear and binary search algorithms. (2)

4) Consider the tree structure given in figure Q4A and explain the following: (5)

A)

i. Memory representations of a binary tree

ii. Depth of a binary tree

iii. Degree of a tree

iv. Inorder traversal

v. Postorder traversal

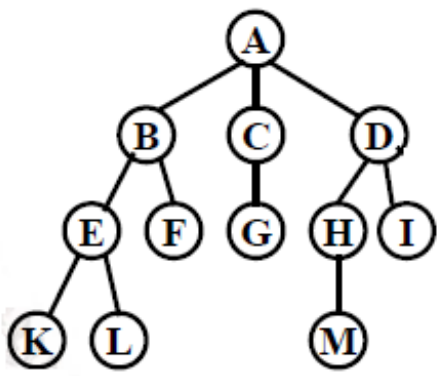

Figure Q4A.

B) Write the prefix and postfix expressions for the expression **a/b^c+d*e-f*g .** Show all the conversion steps**.** (3)

C) Can we implement a queue using a stack? Provide proper justification (2)

5) Write a c++ program to perform the following: (5)

A)

i. Represent a sparse matrix.

ii. Search for an element in the sparse matrix . If the element is present display its row and column; else display a message.

B) Suggest a suitable data structure for the following applications with proper justification: (3)

i. File directory management in a computer system

ii. Maintaining the playlist in media players

iii. Customer calls handled in BPO

C) Consider the graph given in Figure Q5C and perform Depth First Search. Consider node A as start node. (2)

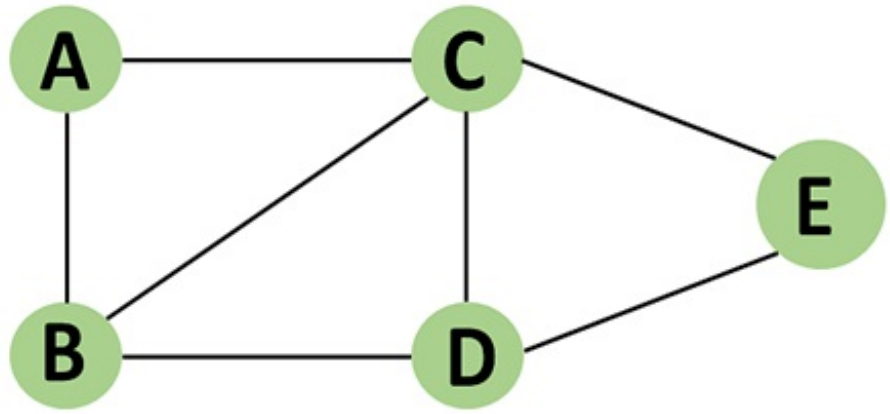

Figure Q5C

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