Question Paper

Exam Date & Time: 23-Apr-2022 (02:00 PM - 05:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

THIRD SEMESTER B.TECH (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNCATION ENGG.) MAKE UP EXAMINATIONS, APRIL 2022

DATA STRUCTURES [ICT 2153]

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

A

Answer all the questions.

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

1) Write a function to sort an array in ascending order using radix sort technique. Trace the function for the following array elements: (5)

A) 23, 01, 56, 66, 34, 24, 11, 31, 14, 67, 90, 37, 88, 76, 22

B) Write a user defined function to merge two sorted circular singly linked lists without creating a new list. Consider that the pointers to the first node of list A and list B are passed to the merge function. (3)

C) Write a recursive function to search for an element in a singly linked list. (2)

2) Write a complete C++ program to add two polynomials represented using Singly Linked List (SLL) and store the resultant list in a new SLL. (5)

A) Write the output for the following display function assuming the node structure to be < coe, exp, node *) and polynomial content as : 4,7--->3,5--->2,2--->1,1,NULL

```
void node::display(node *f) // f holds the address of the first node

{
node* c=f;
while(c)
{

if(c->exp%2==0) cout< < c->coe< < "^"< < c->exp< < " ";

c=c->next;

}
}
```

B) Write a complete class definition with data members and required member functions for performing enqueue and dequeue operations on a circular queue. (3)

C) Convert A + B / (C * D-E) % F to prefix form. Write the stack contents at each step. (2)

3) Write a C++ program to read students' name, roll no., marks in four subjects and maintain them in a sorted singly circular linked list according to the roll number. Also, write a member function to delete student information with a specific roll number. (5)

A)

B) What is an expression tree? Construct an expression tree for the expression A + B - C * D / E + F + G * H using stack with each step of construction shown clearly. (3)

C) What is the output of the following program? What does the following fun() do in general? (2)

```
int fun(int a[],int n)
{
int x;
if(n == 1)
return a[0];
else
x=fun(a, n-1);
if(x>a[n-1])
return x;
else
return a[n-1];
}
void main()
{
int arr[] = {12, 10, 30, 50, 100};
cout< < fun(arr, 5);
}
```

4) Write a C++ program to do the following: (5)

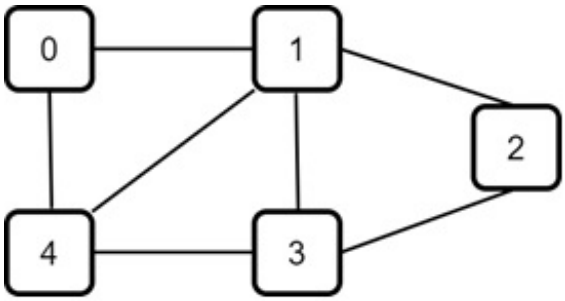
A) i. Define a class Sparse with row, column and value as data members, relevant member functions to initialize the data members and display methods.
ii. Write a member function to accept a 2D matrix from the user and check whether the matrix is sparse or not. If sparse then create object instance of a Sparse class.
iii. Write a member function to obtain the fast transpose of a sparse matrix.

B) What are the different ways in which the graph can be represented? Explain each with a suitable example. (3)

C) Construct a min heap for the input: 35, 33, 42, 10, 14, 19. Show each step of the construction. (2)

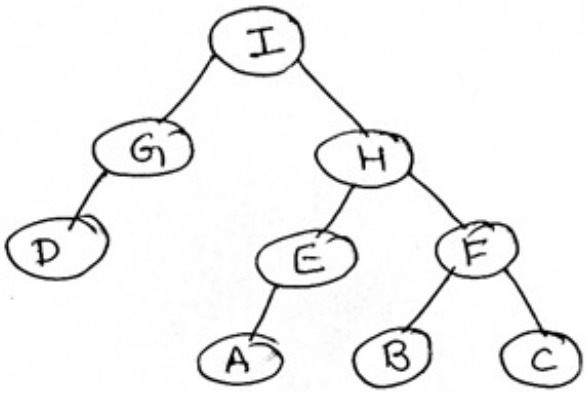
5) Explain Breadth-First Search (BFS) algorithm with respect to the graph shown in Figure Q.5A. Also, write the function for the same. (5)

A)



B) Write the recursive function for inorder, preorder and postorder traversal of a binary tree. Also, write the traversal sequence for each of the methods for the tree given in Figure Q. 5C. (3)

C) What is a threaded binary tree? Write the threaded binary tree representation for the tree shown in Figure 5C. (2)



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