

Registration No :

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Total Number of Pages : 04

Course: BTECH
REC4G002, RAE4G003, RAU4G003,
RME4G003, RMF4G003, RML4G003,
RMM4G003, RMN4G003, RPL4G003

4th Semester Regular / Back Examination: 2022-23

SUBJECT: Data Structure

BRANCH(S): ECE,ETC, AERO,AME, AUTO, MECH, MANUTECH, MINERAL, MME,METTA,
MINING, PLASTIC

Time : 3 Hour

Max Marks : 100

Q.Code : M413

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2x10)

- Differentiate between nonlinear data structure and linear data structure.
- Write overflow and underflow conditions of stack.
- List out the advantages of doubly linked lists over single linked lists with examples.
- Consider a Single Linked List having elements $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$. Start pointer holds the address of first node 1. What is the output of the following function?

```
void sum() {  
    struct node *P = start → next;  
    int total = 0;  
    while ( P → next != NULL )  
    {  
        total = total + P → info;  
        P = P → next; }  
    printf( “ Total = %d”, total); }  
}
```

- Define a complete binary tree and strictly binary tree with suitable example.
- Write the limitations of array implementation of simple queue. How it can be avoided?
- Differentiate between strongly connected graph and weakly connected graph.
- Consider an open address hash table with a total of 10000 slots, containing of 9800 entries .What is the expected number of probes in a successful search?
- Differentiate linear probing and quadratic probing technique to resolve collision in hashing.
- Sort the given elements in ascending order using bubble sort –

2, 1, 4, 0, 7, 3

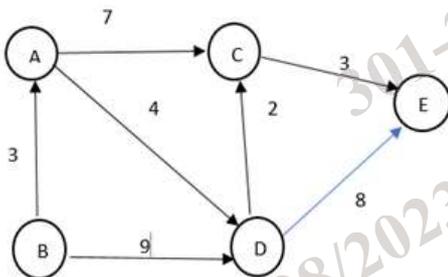
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of (6 × 8) Twelve)

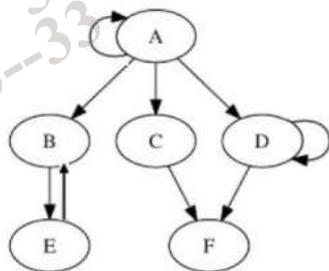
- a) Discuss the algorithm for insertion, deletion and display operation in a circular queue.
- b) Develop a C-function to merge two single lists having the following elements. Start holds the address of first node of List 1 and head holds the address of first node of List 2.

List 1: 10 → 15 → 22 → 46 → 17 → 39
 List 2: 23 → 12 → 42 → 36 → 41

- c) Construct an AVL tree from the list of given elements:
 55, 66, 77, 15, 11, 33, 22, 35, 25, 44, 88.
- d) Discuss height and depth of a binary tree. Construct a binary search tree from these numbers: 90, 36, 58, 96, 32, 92, 12, 93, 24, 97, 38, 60 and 98
- e) Discuss the data structures used for Depth First Search (DFS) and Breadth First Search (BFS) algorithm on a Graph data structure. Perform the Depth First Search for the following graph, starting from node B.



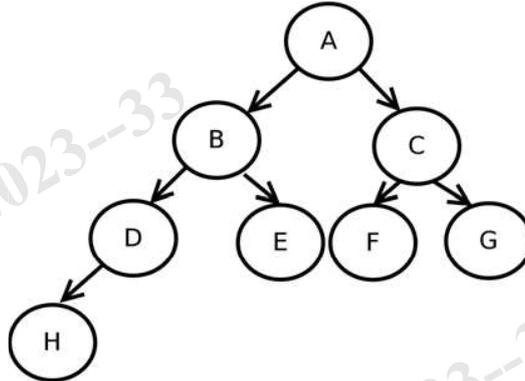
- f) Define path matrix. Represent the following graph in memory using array and linked list representation.



- g) List out the properties of Max-Heap and Min-Heap. Sort the following list of numbers in descending order using Heap sort.

77, 85, 5, 7, 10, 72, 50, 21

- h) Let A is the array of the following elements $A = \{2, 4, 6, 8, 9, 10, 12, 13\}$. Search the element 12 using binary search technique. Write its time complexity.
- i) Discuss the advantage and average efficiency of quick sort? Apply Quick sort on the following data and show the contents of the array every pass:
48, 7, 26, 4, 13, 23, 98, 57, 10, 5, 32
- j) perform the preorder, inorder and postorder traversal for the following tree:



- k) Write an algorithm / C code to delete a node from the beginning and end of a single link list.
- l) Given N set of integers. Write a program in C to arrange them in descending order using insertion sort techniques

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

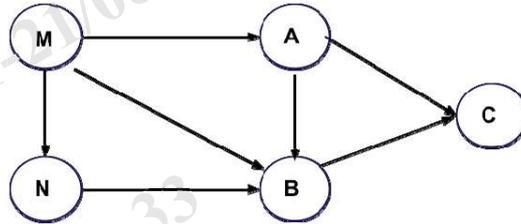
- Q3 Write the algorithm for infix to postfix expression conversion. Convert the following expression written in infix form into its equivalent postfix form using stack by showing each step. (8+8)

Infix: $K + (L * M - (N / O \$ P) * Q) * R$

- Q4 Discuss the concept of collision in Hashing technique. List out different collision resolution techniques. Consider a list of size 20 ($m = 20$). Insert the following list of keys given below into the Hash table and resolve collision using various collision resolution techniques. Take the hash function of your choice. (2+6 +4+4)

96, 48, 63, 29, 87, 77, 48, 66, 69, 93, 61

- Q5** What do you mean by graph traversal? What are the data structures used for graph traversal? Write the algorithm for DFS and Perform the Depth First Search of the graph given below where M is the starting node. Generate the spanning tree of the graph by using DFS and BFS. (2+2+6+6)



- Q6** Discuss height and depth of a binary tree. Construct a binary search tree from these numbers: 90, 36, 58, 96, 32, 92, 12, 93, 24, 97, 38, 60, and 98. Delete the root node from this tree. (3+7+6)