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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS3PCDST **Max Marks: 100**
Course: Data Structures **Date: 15.05.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Convert the following Infix expression to Prefix and Postfix expression. Show the steps clearly. **8**

i) (A+B/C) ^ (D ^E/F)/G

ii) (X/Y+Z) ^W-U-V

b) Evaluate the following given Postfix expression with values of A=1, B=2, C=3, D=4, E=5, F=6 and write an algorithm for the same. **6**

AB+CD$E-*F/ [$ represents Exponentiation]

c) Analyze the given lines of code below and write the output with justification. **6**

```
int CalculateNum(int num, int len)
{
 if (len != 1)
{
return (((num % 10) * pow(10, len - 1)) + CalculateNum(num / 10, --len));
 }
else
{
return num;
 }
}
int main()
{
 int num = 0, result = 0, len = 0, temp = 0;
printf("Enter Number: ");
 scanf("%d", &num);
 temp = num;
while (temp > 0)
{
 temp = temp / 10;
```

```
len = len + 1;
 }
 result = CalculateNum(num, len);
 printf("Result is: %d", result);
 return 0;
}
```

UNIT - II

2	a)	Circular Queue is advantageous than Linear Queue? Justify your answer with an example. Write a function to insert and delete an element from a circular queue.	**6**
	b)	The department has planned to conduct a workshop on "AI and Machine Learning" for a maximum 75 participants on first come first serve basis. It should display the message like registration open. Once all 75 participants are registered, the message should be displayed as "Registration Closed". If the candidate cancels the registration, then it can be registered by the other interested participant based on the availability. Identify the suitable data structure and develop a C program for the above scenario.	**8**
	c)	Differentiate between malloc() and calloc() functions with suitable examples.	**6**

UNIT - III

3	a)	Analyze the advantages and disadvantages of storing data in linked list and in an array.	**6**
	b)	Write a function to delete consecutive three nodes from a given position in the Single Linked List by checking all extreme cases.	**8**
	c)	Describe how Doubly Linked list is advantageous compared to Singly Linked list with an example.	**6**

OR

4	a)	Analyze and explain how linked implementation of Queue is advantageous compared to implementation of Queue using array.	**6**
	b)	Write a program for the following scenario using Singly linked list: Create a linked list with starting address stored in Start. Each node contains information like: Student USN, Student name and number of previous backlog courses. Once the declaration of result, read USN and update total backlogs, delete those students if number of backlogs is greater than 4 courses.	**8**
	c)	Demonstrate the implementation of Stack using Linked List with an example.	**6**

UNIT - IV

5	a)	Write functions for each of the following: **i)** Find the maximum element in a Binary search tree. **ii)** Count number of nodes in a Binary tree	**6**

b) Construct a Binary tree for the following Preorder and Inorder traversal: **8**

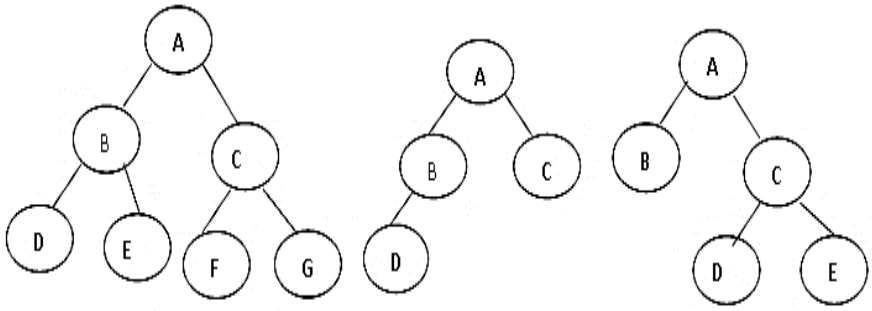
Preorder: A B C D E F G H I J

Inorder: B C A E G D H F I J

c) Demonstrate the different cases of deleting element from Binary tree with an example for each. **6**

OR

6 a) Identify the type of Binary tree for the following trees and justify your answer. **6**



b) Create Binary Search tree for the following list of elements and perform Delete 85, Delete 12, Delete 50 operations. **8**

50, 75, 25, 30, 12, 85, 60, 70, 52

c) Write a recursive function to traverse the tree in Inorder, Preorder and Post order method. **6**

UNIT - V

7 a) Differentiate between Linear probing, Quadratic probing, Double Hashing and Rehashing technique with example. Consider the following hash table with the current status and hash key=Key % 11. Explain the situation what happens when going to insert next key element 87 using Linear Probing method and rewrite the hash table. **10**

Index	Value
0	43
1	
2	46
3	25
4	36
5	
6	
7	18
8	29
9	
10	10

b) Construct a Hash table for the following numbers: **10**

28, 4, 19, 1, 22, 16, 12, 0, 5, 7

Show how collision is resolved using Extendible Hashing with each step demonstrated clearly. Also, mention how directory expansion and bucket splitting taken place. Consider Bucket limit = 3.

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