

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, Dec 2022

BCA, Semester III

Roll No.....

CS1122: C++ AND DATA STRUCTURES Time: 3 hours

Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Scientific calculators are allowed.
 4. Attempt all the questions. Explain your answer wherever required
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Q.1 Few declarations in C language are given below. For each declaration, state how much memory will be allocated. Assume an integer and a pointer take 4 bytes and a float data type takes 8 bytes. **04**
(LO-1)

a. `char a[10][30];`

b. `int max_size=10;`
`struct myshop{ char name[max_size][20];`
`float price[max_size];`
`}`
`struct myshop shop;`

c. `struct snode { char book_name[20][30];`
`struct snode * next;`
`}`
`struct snode * stack;`

d. `struct node { int data;`
`struct node * next;`
`}`
`struct queue {struct node * front;`
`struct node * last;`
`}`

`struct node n1, n2; struct queue Q1;`

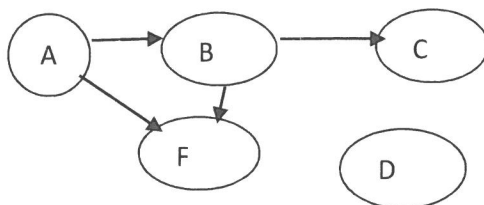
Q.2 For each of the functions $f(N)$ given below, write the closest bound in Big-O notation. Choose your answers from the following: $O(N^2)$, $\log_2 N$, $O(1)$, $O(2N)$, $O(N)$ **02**
(LO-4)

- a) $f(N) = 50000$
- b) $f(N) = \log_2 N + N/8$
- c) $f(N) = N \cdot \log_2(24N) + N$
- d) $f(N) = (N^2)^2 + 2N - 1$

- Q.3** Q3. (a). Define a structure for stack of clothes if a cloth is defined by its length. You can assume the maximum size of stack 50. Write the Push function for the stack if implementing using arrays. 04
(LO-1)
(LO-2)
- (b). Define a structure for a queue of passengers if a passenger is defined by its Aadhaar card. Write the Insert function for the queue if queue is implemented using linked list.
- Q.4** Suppose the structure of a binary tree node is: 04
(LO-2)
- ```

struct tree_node { int data;
 struct tree_node * left;
 struct tree_node * right; }

```
- a. Write a piece of code to do the following step by step: (3)
1. Create a node parent and store 10 in data field
  2. Create another node and store 5 in it and make it the left child of parent
  3. Create one more node and store 15 in it and make it the right child of parent
- b. Write the preorder, postorder and inorder traversals of the tree created by you. (1)
- Q.5** Q5. Sort the given data (50, 30, 100, 20, 60) in ascending order using: 03  
(LO-5)
- a. Bubble sort (2)
  - b. Apply quicksort, perform just one step of partitioning (1)
- Q.6** Insert the following data in a binary search tree. 02  
(LO-3)
- 50, 40, 20, 25, 80, 75, 65, 100, 15
- Q.7** Insert the following keys in hash table using the hash function 03  
(LO-5)
- $h(\text{key}) = \text{key} \bmod 10$  and for collision, use Linear probing.
- 40, 60, 10, 34, 25, 90, 56, 67, 78, 89
- Q.8** How many number of comparisons we have to perform to search the key 67 in the data given in Question No.7 if: 03  
(LO-3)
1. The data is stored in an array as it is
  2. Data is stored as a sorted array and binary search is used
  3. Data is stored in the hash table as in Question 7.
- Q.9** If the root address of a binary tree is given, then write a function to count the number of leaf nodes in the tree. Your function should return the no. of leaf nodes. 02  
(LO-3)
- Q.10** (a) For the given graph, write the adjacency matrix of the graph. 03  
(LO-2)  
(LO-3)



- (b) Write a topological ordering for the graph given above. (1)