Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
DATA STRUCTURES

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

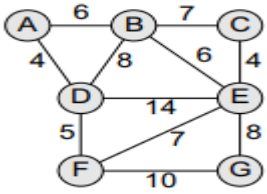
SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Describe the terms time and space complexity.
b.	Distinguish between calloc() and malloc() function.
c.	Calculate the address of the 3rd element of an integer array A[6][2] using the starting address 2000.(Assume integer takes 2 bytes).
d.	Write postfix notation of infix expression a*(b+c/d).
e.	Illustrate the data structure that follows LIFO order.
f.	Compare complete binary and strict binary trees.
g.	Write the time complexity of quicksort and bubble sorting algorithm

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Consider 20 X 5 two-dimensional array "marks" which has its base address = 1000 and the size of an element = 2. Calculate the address of the element, marks[18][4] according to row-major order and column-major order. Write the general formula for finding the address of the multidimensional array.
b.	Describe the term stack data structures. Illustrate the implementation of different stack operations with help of a program.
c.	Define the term BST. Explain different types of tree traversal techniques with help of an example.
d.	Write the Quicksort algorithm and illustrate the steps of the algorithm to sort the following data: 25, 143, 454, 75, 28, 148, 435, 566, 34.
e.	Apply prims algorithm to find the minimum cost spanning tree on the given graph. 

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Illustrate the structure ofthe doubly linked list. Write an algorithm to add a new node at the end of the doubly-linked list.
(b)	Illustrate the structure of the circular linked list. Write an algorithm to add a new node at the beginning of the circular linked list.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Demonstrate the step-by-step conversion of the following infix expression into a postfix expression. A – (B / C + (D % E * F) / G)* H)
(b)	Compare non-tail and tail recursion. Construct the recursion tree for solving the tower of Hanoi problem with n=4.

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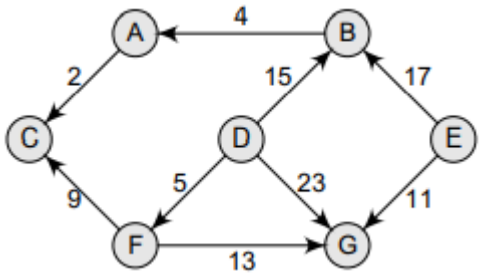
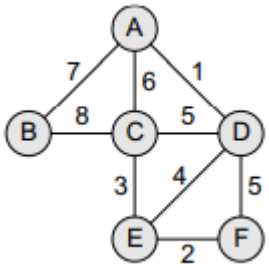
5. Attempt any *one* part of the following: **7 x 1 = 7**

(a)	Construct the binary tree using the following traversals In-Order Traversal : D B H E I A F J C G Post-Order Traversal: D H I E B J F G C A
(b)	Construct the Huffman tree using the following (node, Frequency) pairs A 7, B 9, C 11, D 14, E 18, F 21, G 27, H 29, I 35, J 40.

6. Attempt any *one* part of the following: **7 x 1 = 7**

(a)	Write the Dijkstra algorithm. Apply the algorithm on the following graph to find the single source shortest path. (Assume A as source). 
(b)	Apply BFS and DFS Algorithms on the following graph. 

7. Attempt any *one* part of the following: **7 x 1 = 7**

(a)	Describe the term AVL Tree. Illustrate step-by-step construction of AVL tree using the following data. 23,45,13,56,4,6,7,32,84,89,37,96
(b)	Write a program to implement merge sort algorithm.