



Roll No:

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BTECH
(SEM IV) THEORY EXAMINATION 2021-22
BASIC DATA STRUCTURE AND ALGORITHMS

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A****1. Attempt all questions in brief.****2x10 = 20**

Qno	Questions	CO
(a)	Determine the worst-case time complexity of inserting n elements into an empty linked list, if the linked list needs to be maintained in sorted order?	1
(b)	What do you understand by time complexity of algorithm? Explain BIG Oh notation with bubble sort example.	1
(c)	Find out number of items in following cases. i. top=5, size=10 (Stack) ii. rear=5, front=2, size=10 (Queue) iii. rear=2, front=5, size=10 (Circular Queue)	2
(d)	Compute the result evaluating the postfix expression 15 5 + 12 5 / * 5 - is .	2
(e)	Illustrate when a sorting technique is called stable?	3
(f)	Consider the array A = <14, 11, 13, 12, 6, 9, 10, 12, 8, 7>. After building heap from the array A, determine the depth of the heap and the right child of max-heap. (Root is at level 0).	3
(g)	The post order traversal of a binary tree is 8,9,6,7,4,5,2,3,1. The in order traversal of the same tree is 8,6,9,4,7,2,5,1,3. The height of a tree is the length of the longest path from the root to any leaf. Predict the height of the binary tree is .	4
(h)	The following numbers are inserted into an empty binary search tree in the given order: 11, 6, 3, 5, 15, 12, 16. Calculate the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?	4
(i)	Differentiate between Graph and tree.	5
(j)	Describe multigraph and Digraph.	5

SECTION B**2. Attempt any three of the following:****10x3 = 30**

Qno	Questions	CO
(a)	What do you mean by linked list? Discuss structure of all possible types of linked list.	1
(b)	Describe tail recursion and non-tail recursion with suitable example. Also discuss the solution for Tower of Hanoi problem for 4 discs.	2
(c)	What are the possible traversals of a tree? Write their recursive algorithms with suitable example.	3
(d)	Use Heap sort algorithm to sort the given array and write all the steps: 82, 90,10, 12,15, 77,55	5
(e)	Demonstrate Breadth First Search (BFS) algorithm to traverse a graph.	4

SECTION C**3. Attempt any one part of the following:****10x1 = 10**

Qno	Questions	CO
(a)	Write structure of linked list that can be used to represent a polynomial of the following type $4x^4 y^4 - 9x^3 y^2 + 6x^2 - y + 8$. Write an algorithm to find addition of two polynomials	1
(b)	What is Sparse matrix? Explain how a Sparse matrix can be implemented by using the linked list?	1



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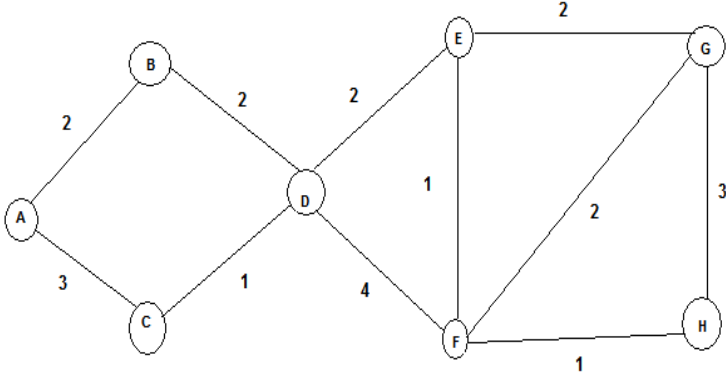
4. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	State the algorithm to evaluate the postfix expression. And apply it on following expression (i) $A B D + * E / F G H K / + * -$ (ii) $10 5 + 60 6 / * 8 -$	2
(b)	Two matrices M1 and M2 are to be stored in arrays A and B respectively. Each array can be stored either in row-major or column-major order in contiguous memory locations. The time complexity of an algorithm to compute $M1 \times M2$ also writes a program to complete above said function.	2

5. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Do the following operations for constructing a BST i) 45, 37, 98, 76, 13, 39, 105, 80, 5 insert element as per their occurrence. ii) Delete 39 and 45 respectively Now Traverse final BST in In order, Preorder and post order.	3
(b)	What is Thread binary tree? Explain the significance of threaded binary tree?	3

6. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Apply Kruskal's and Prim's algorithm to find the minimum spanning tree in the following given graph. 	4
(b)	Write an algorithm for topological sort. Give an example	4

7. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Write quick sort algorithm and its analysis. Use Quick sort algorithm to sort 9, 11, 10, 1, 60, 10, 6, 25, 40, and 30. Is it a stable sorting algorithm? Justify.	5
(b)	Write merge sort algorithm and its analysis. Use merge sort algorithm to sort 9, 11, 10, 1, 60, 10, 6, 25, 40, and 30. Is it a stable sorting algorithm? Justify.:	5