	ADAMAS UNIVERSITY		
	END-SEMESTER EXAMINATION : JANUARY 2021		
	(Academic Session: 2020 – 21)		
Name of the Program:	B. Tech	**Semester:**	III
Paper Title :	**Data Structures and Algorithms**	**Paper Code:**	**ECS42101**
Maximum Marks :	40	**Time duration:**	3 Hrs.
Total No of questions:	22	**Total No of Pages:**	2
(Any other information for the student may be mentioned here)	1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, and Date of Exam. 2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. 3. Assumptions made if any, should be stated clearly at the beginning of your answer.		

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1. i) Define Ø with suitable graph and example.

    ii) Define full binary tree with suitable example.

    iii) Why stack is called LIFO list?

    iv) Define a B-tree with suitable example.

    v) What is the drawback of a linear queue?

GROUP –B

Answer *any three* of the following $3 \times 5 = 15$

2. i) Write a C function to insert a node at a specified position in a singly linked list.

    ii) Evaluate the postfix expression 8 2 + 4 * 5 / 6 3 / 2 / - using stack. **[3 + 2]**

3. i) Write a C function to delete a node from a doubly linked list.

    ii) Write a C function to insert an element into a linear queue by using an array. **[3 + 2]**

4. i) Write a C function to implement push operation in a stack by using a singly linked list.

    ii) Convert the following postfix expression into its equivalent infix expression by using stack:
    $$A B + C * D E - - F G + \wedge$$
    [3 + 2]

5. i) Convert the following infix expression into its equivalent prefix expression by using stack:
    $$(A + B * (C \wedge (D / E) \$ F)) + G$$

    ii) Write a C function to delete an element from a circular queue by using an array. **[3 + 2]**

6.   i) Insert the following keys in the order given below to build into an AVL tree.
A, Z, B, Y, C, X, D, W
Clearly mention different rotations used and balance factor of each node.

ii) Prove that the maximum number of nodes on level 'i' of a binary tree is 2^i, i> = 0. Hence prove that the maximum number of nodes in a binary tree of height 'h' is 2^h-1, h> = 1.

iii) Use Prim's Algorithm to find a minimum cost spanning tree of the following weighted graph. Give the total weight of the MST.   **[4 + 3 + 3]**
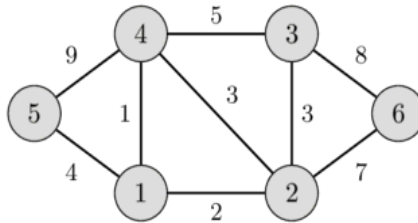
7.   i) Draw the binary tree whose in-order and pre-order traversal sequence of nodes are given below:

In-order: D G B A H E I C F
Pre-order: A B D G C E H I F

ii) Define Expression tree. Draw the expression tree for the following expression.
$(2x + y) * (3a - b)^3$

iii) Prove that the number of odd degree vertices in a graph is always even.   **[4 + 3 + 3]**

8.   i) Construct a B-tree of order 3 with the following data:

50, 40, 60, 30, 70, 20, 80, 10, 90, 9, 99

ii) Write a C function to implement merge sort algorithm.

iii) Find out the worst-case time complexity for merge sort algorithm.   **[4 + 4 + 2]**

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