

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (Second Semester - Regular) Examinations, April 2026

25FYES12004 – Data Structures

(Common to All branches)



Time: 3 hrs

Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- a. Given a stack S[4], apply the below list of operations on the stack: PUSH(A), PUSH(B), POP(), PUSH(C), PUSH(D), POP(), POP()
Find the list of popped elements from the stack?
Find the list of elements present in the stack?
- b. Given an array A[10] in which it contains a series of numbers from index 0 to index 7.
Apply insertion of a new element, say X, at index 2 and explain the process.
- c. Consider that a *START pointer holds the address of the 1st node of a single linked list.
Write an algorithm to display all the nodes of this linked list.
- d. Construct a binary tree using the traversal sequence of nodes given below:
In-order sequence: F D B E I G J A C H
Post-order sequence: F D I J G E B H C A
- e. Given a Tree below:
Find out the height and balance factor of each node of this tree.

CO # Blooms
 Level

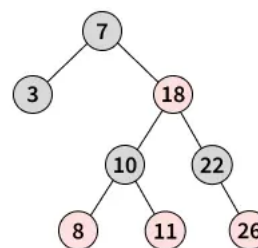
CO5 K3

CO3 K2

CO3 K3

CO5 K3

CO4 K4



PART – B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

2. a. Develop an algorithm that accepts a matrix with values and then tests whether the matrix is sparse or not. If it is a sparse matrix, then how do you store the non-zero elements' information into another 3-column matrix?
- b. Given a sequence of integers: 55, 11, 22, 99, 44, 77, 33, 50, 66, 88. Construct a max-heap tree using this list of numbers.

Marks CO # Blooms
 Level

5 CO4 K3

5 CO6 K3

(OR)

- c. Write down the algorithms to traverse all the nodes of a binary tree in three different ways.
- d. Assume a double linked list given where the *START pointer points to the first node. A new node *FRESH was created which contains some value.
Design two algorithms:

5 CO3 K3

5 CO3 K3

- 3.a. Given a list of 10 integer in an array A[10]. Write an algorithm to apply the insertion sort approach to sort the elements in ascending order.

5 CO3 K3

- b. Construct a binary tree when the sequence of nodes is given as
Inorder : 10, 20, 25, 30, 35, 50, 60, 70, 90
Preorder : 50, 20, 10, 30, 25, 35, 70, 60, 90

5 CO4 K4

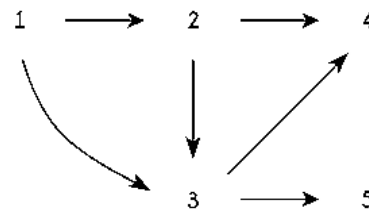
Find the below information for the binary tree generated:

What are the terminal nodes?
 What are the internal nodes?
 How many NULL pointers exist?
 What are the nodes available at level 2?

(OR)

- c. A Directed Graph given below:

Write down the algorithm to traverse all the nodes using Depth First Search method by considering the starting node is 1.



5 CO6 K3

- d. Given a sequence of elements: 70,20,10,30,40,50,60,45,75,95,
 Construct an AVL tree by inserting each element.

5 CO6 K3

- 4.a. Given an infix expression $Q = A * S + (E * F \wedge G) / H$
 Find its equivalent postfix using stack.

5 CO5 K3

- b. Given a list of elements as follows: 570, 930, 786, 345, 234, 432, 975, 444, 210, 339. Explain the process of radix sort for sorting the above elements in ascending order.

5 CO5 K3

(OR)

- c. What is hashing? Use the division method and folding method to generate hash addresses for the given key values: 11, 19, 35, 43, 64, 59, 32, 49

5 CO6 K3

- d. Explain how selection sort works and write down the algorithm for sorting a list of numbers in ascending order.

5 CO2 K2

- 5.a. Write algorithms to implement insertion and deletion operations on a linear queue using array.

5 CO3 K3

- b. Briefly elaborate the evaluation process of given postfix expression $P = 3, 4, 15, 4, 2, /, -, *, +, 10, +$ using Stack.

5 CO5 K3

(OR)

- c. What is row-major order and column-major order?
 Given a matrix $Q[6][7]$ having base address 1000, the size of each memory is 4 bytes. Find the address of $Q[4][2]$ in row-major order and also in column-major order.

5 CO2 K2

- d. Given a list of number 50, 30, 90, 20, 40, 80. Construct a binary search tree by considering the 1st element as root node. Write down the algorithm to apply binary search operation on the constructed tree.

5 CO5 K3

- 6.a. Write an algorithm to merge the elements of two given arrays having sorted list of integers.

5 CO3 K3

- b. Draw a neat diagram for showing the LR rotation of an AVL Tree and explain it.

5 CO4 K4

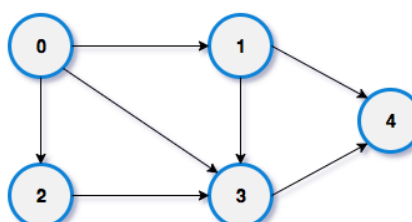
(OR)

- c. Consider a single linked list of 5 nodes given. Implement the operations using LIFO concept: i) insertion of a node ii) deletion of a node

5 CO5 K3

- d. Given a directed graph:

Write down the two ways of memory representation of graph namely adjacency matrix, incidence matrix.



5 CO6 K2

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