



**DHARMSINH DESAI UNIVERSITY, NADIAD**  
**FACULTY OF TECHNOLOGY**  
**B.TECH. SEMESTER III COMPUTER ENGINEERING**  
**SUBJECT: (CE316) DATA STRUCTURES AND ALGORITHMS**

Examination : External Regular Examination

Seat No : CE 31

Date : 06/11/2023

Day : Monday

Time Duration : 10.00 to 1.00 pm

Max. Marks : 60

**INSTRUCTIONS:**

1. Answer each section in separate answer book.
2. Figures to the right indicate maximum marks for that question.
3. The symbols used carry their usual meanings.
4. Assume suitable data, if required & mention them clearly.
5. Draw neat sketches wherever necessary.

**SECTION - I**

**Q.1 Attempt the following questions**

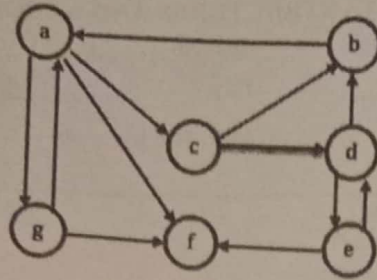
- CO1 U** (a) Suppose the following operations are performed, in the order given, beginning with an empty structure: **push(2), push(1), getTop, push(3), getTop, pop, push(4), getTop, pop, getTop, pop, getTop, pop.** [10]  
Answer the following questions: [02]
1. If these operations are performed on a Stack, what values are returned by the five **getTop**(Returns the top element of the stack) operations (give them in order)?
  2. Suppose we replace "push" with "enqueue", "pop" with "dequeue", and "getTop" with "getFront"(Returns the front element of the queue). We perform the operations on a Queue. What values are returned by the five **getFront** operations (give them in order)?
- CO3 E** (b) Evaluate the given Prefix Expression:  $+ - 9 2 7 * 8 / 4 12$ . [02]
- CO1 U** (c) A certain sorting technique was applied to the following data set, [02]  
45, 1, 27, 36, 54, 90  
After two passes, the rearrangement of the data set is given as below:  
1, 27, 45, 36, 54, 90  
Identify the sorting algorithm that was applied. Justify your answer.
- CO4 N** (d) State whether the given statements are true or false: [02]
1. In Quick sort, the execution time is least dependent on the initial ordering of the input.
  2. One can implement a stack (of unbounded size) based on an array so that each individual push/pop operation is time  $O(1)$ .
- CO2 R** (e) Given the circular queue representation with **Front = 0** and **Rear = 2**. Give the values of Front and Rear after performing the following operations in order: [02]  
**dequeue, enqueue(50), dequeue, enqueue(60), enqueue(70), dequeue, enqueue(80), enqueue(90).** Show all the steps. [05]

Index	0	1	2	3	4	5
Values	20	30	40			

**Q.2 Attempt Any TWO from the following questions.**

- CO3 A** (a) Double ended queue is a linear data structure where the insertion and deletion operations are performed from both ends. Write an Algorithm to implement double-ended queue using linked list. [10]  
[05]

- CO3 A (b) Write an Algorithm for Breadth First Search and print all the nodes of the given [05]  
graph starting from node A, using the Breadth First Search Algorithm.

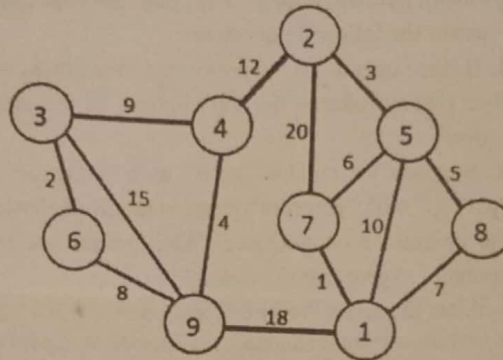


- CO3 A (c) Convert the following infix expression into a postfix expression using the [05]  
REVPOLISH Algorithm.  $A - (B / C + (D \wedge E * F) / G) * H$ . Show all the  
steps.

Q.3 Attempt the following questions.

[10]

- CO2 N (a) Find the minimum spanning tree for the given graph using Prim's Algorithm [05]  
with node 1 as the starting node. Show Algorithmic Steps.



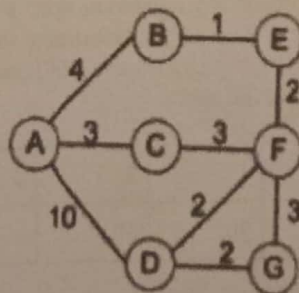
- CO2 C (b) Apply Radix Sort on the given data to sort them in ascending order. Show all [05]  
steps. Data: 132, 543, 783, 63, 7, 49, 898.

OR

Q.3 Attempt the following questions.

[10]

- CO2 N (a) Apply Dijkstra's Algorithm to find the shortest path from Node A to all the [05]  
other nodes for the given graph. Show all the steps.



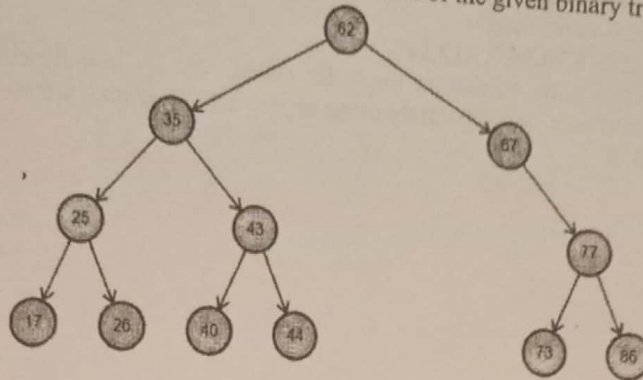
- CO2 C (b) Apply Merge sort on the given data to sort them in ascending order. Show all [05]  
steps. Data: 19,17,13,11,10,5,6.

## SECTION - II

Q.4 Attempt the following questions.

CO1 U (a) Write the converse Pre-order traversal of the given binary tree.

[10]  
[02]



CO1 U (b) Compare Singly Linked List and Doubly Linked List.

CO3 C (c) Draw expression binary tree for the infix expression:  $((a-b)-c^d)*e+f$

[02]  
[02]

CO2 N (d) Write a recursive function to identify if a given linked list is circular or not.

CO1 N (e) Differentiate strict binary tree and complete binary tree. Draw one example of each.

[02]  
[02]

Q.5 Attempt Any TWO from the following questions.

CO3 A (a) Write an algorithm to insert a node at the end of a doubly linked list. Note that you have only a head pointer to access the doubly linked list.

[10]

CO3 A (b) Consider a hash table of size eleven, with a starting index zero, and a hash function  $(3x+1)\%11$ , where  $x$  is the data key. Assuming the hash table is initially empty, show the contents of the table when the below data sequence is inserted. Assume that each bucket has a capacity of 1 element only. Data: 4, 3, 9, 8, 11, 40, 71, 13, 14.

[05]

CO3 A (c) Generate a binary tree (if possible) from the In-order and Pre-order traversal of it as given below and show each level as a separate step. Inorder: Q, B, K, C, F, A, G, P, E, D, H, R Preorder: G, B, Q, A, C, K, F, P, D, E, R, H

[05]

Q.6 Attempt the following questions.

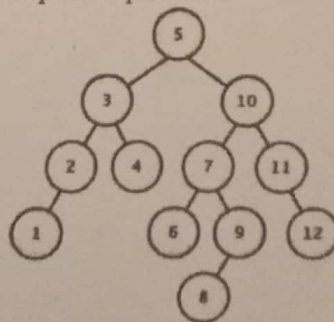
CO2 N (a) Create a binary search tree with the following input: 98, 2, 48, 12, 56, 32, 4, 67, 23, 87, 24, 55, 46 (a) What is the height of the Binary search tree? (b) Delete 56, 32, 23 and 55 from the tree. Show the deletion of each node with appropriate diagrams.

[10]

[05]

CO2 C (b) Modify the below given AVL Tree by performing the deletion of nodes in the mentioned order: 11, 7, 3, 10, 8, and 2. Show each deletion separately with the diagram and mention the step that is performed.

[05]





OR

- Q.6 Attempt the following questions. [10]
- CO2 N (a) Create a Red-Black Tree for the given data, by inserting each number, picked in the order from left to right. Show each insertion separately with the diagram and mention the step that is performed. [05]  
Data: 4,12,19,18,20,16,7,5,17,14
- CO2 C (b) Insert the following entries, in the order stated, into an initially empty B-tree of order 4. Show each step separately using appropriate diagrams. Data: 4, 2, 20, 10, 1, 14, 7, 11, 3, 8 [05]