313301-DATA STRUCTURE USING 'C' (DSC)

QUESTION BANK

UNIT-1

Q1. What is a data structure?

Q2. What does abstract data type means?

Q3. Describe big 'O' notation used in algorithm.

Q4. Explain different approaches to design an algorithm.

Q5. State different types of data types.

Q6. Explain Classification of data Structure with diagram.

Q7. Define term data type and Abstract data type. Comment upon the significance of both.

Q8. Write down different operation performs on arrays.

Q9. What is Dynamic Memory Allocation? Explain following function of C language in the context of Dynamic Memory Allocation.

a) Mallac() b) Calloc() c) Realloc() d) Free()

Q10. What do you mean by complexity of an algorithm? Explain the meaning of worst case analysis and best case analysis with an example..

Q11. What is data structure? Why do we need data structure?

Q12. Define primitive data structure. Give 4 operations of data structure.

Q13. Define Data Structure? Enlist any two types of non-linear data structures along with example.

Q14. Explain time and space complexity of an algorithm.

Q15. Give classification of Data Structure.

UNIT -2

Q1. Write down algorithms for linear Search and for Binary Search..

Q2. Write down algorithms for Bubble Sort.

Q3. Bubble sort algorithm is inefficient because it continues execution even after an array is sorted by performing unnecessary comparisons. Therefore, the number of comparisons in the best and worst cases is the same. Modify the algorithm in such a fashion that it will not make the next pass when the array is already sorted.

Q4. What is Quick sort? Sort the following set of Input data:

69, 19, 43, 16, 25, 40, 132, 100, 145, 7, 15, 18.

Q5. What is the average number of comparisons in a sequential search?

Q6. Sort the following list using Quick Sort technique, displaying each step.

20, 12, 25 6, 10, 15, 13

Q7. The element being searched for is not found in an array of 100 elements. What is the average number of comparisons needed in a sequential search to determine that the element is not there, if the elements are completely unordered?

Q8. What do you mean by hash clash? Explain in detail any one method to resolve hash collisions.

Q9. Which sorting algorithm is best if the list is already sorted? Why?

Q10. Sort the following sequence of element using Selection sort.

66, 77, 11, 88, 99, 22, 33, 44, 55

Q11. Describe insertion sort with a proper algorithm. What is the complexity of insertion sort in the worst case?

Q12. What is quick sort? Sort the following array using quick sort method.

24 56 47 35 10 90 82 31

Q13. How many key comparisons and assignments an insertion sort makes in its worst case?

Q14. Why do we use asymptotic notation in the study of algorithm? Describe commonly used asymptotic notations and give their significance.

Q15. Radix Sort for following list of element

12132, 12465, 54544, 66621, 44654, 45432, 75616, 46316, 79949, 466458

UNIT-3

Q.1 Explain about the types of linked lists

Q.2 Whether Linked List is linear or Non-linear data structure? Why?

Q.3 Explain what the effect will be if both continuous linked versions of sequential search have only one item in the list and when the list is empty.

Q.4 Write an Algorithm to create a single linked list.

Q.5 Write a Procedure to do the following operations

(i) Insert a new node at the end

(ii) Delete the first node

Q.6 Write an Algorithm to count number of node in a single linked list.

Q.7 What are the disadvantages array implementations of linked list?

Q.8 Two linked lists contain information of the same type in ascending order. Write a module to merge them to a single linked list that is sorted.

Q.9 Which sorting algorithm is easily adaptable to singly linked lists? Explain your answer.

Q.10 what is doubly linked lists? Explain with Example.

Q.11 Write an algorithm to insert a node in the beginning of the linked list.

Q.12 Write an algorithm to Search an Element in the linked list.

Q.13 Differentiate between single linked list and doubly linked list.

Q.14 Write a procedure to reverse a singly linked list.

Q.15 Enumerate various operations possible on ordered lists and arrays. Write procedures to insert and delete an element in to array.

Q.16 Write an algorithm to Search an Element in the Sorted linked list.

Q.17 What is Garbage collection? Explain with example.

Q.18 How Underflow and Overflow can be minimize in Linked List? Explain Suitable Example.

Q.19 Explain Circular linked list.

Q.20 Consider following Data and draw the Memory representation diagram of linked list. (Start with Address 5 and Avail with Address 11)

Information	AA	BB	CC	DD	EE	FF		GG	HH
Next element Address	4	6	5	8	7	3	11	9	2

Q. 21 Consider following Polynomial p(x) in One Variable, Draw memory Representation of linked list.

$$P(x) = 2x^8 – 5x^7 – 3x^4 + 4x^2 + 4$$

UNIT -4

Q.1 Evaluate the following prefix expression " ++ 26 + - 1324" (Similar types can be asked).

Q.2 Convert the following infix expression to post fix notation ((a+2)*(b+4)) -1. (Similar types can be asked).

Q.3 Write algorithms for Stack to

a) Insert the elements in stack.

b) Delete the element from stack

Q.4 Stack can be described as a pointer. Explain.

Q.5 Which data structure is needed to convert infix notations to postfix notations?

Q.6 Parenthesis is never needed in prefix or postfix expressions. Why?

Q.7 Minimum number of queues needed to implement the priority queue?

Q.8 Write an algorithm to evaluate a postfix expression. Execute your algorithm using the following postfix expression as your input: A B + C D +*F.

Q.9 What are circular queues? Write down routines for inserting and deleting elements from a circular queue implemented using arrays.

Q.10 In which data structure, elements can be added or removed at either end, but not in the middle? Write application of such Data structure to implement in computer science.

Q.12 A stack is to be implemented using an array. The associated declarations are:

int stack [100]; int top = 0;

Give the statement to perform push operation.

Q.15 Explain how to implement two stacks in one array A [1...n] in such a way that neither stack overflows unless the total number of elements in both stacks together is n. The PUSH and POP operations should run in O (1) time.

Q.18 Assume that a queue is available for pushing and popping elements. Given an input sequence a, b, c, (c be the first element), give the output sequence of elements if the rightmost element given above is the first to be popped from the queue.

Q.20 Reverse the order of elements on a stack S

(i) Using two additional stacks.

(ii) Using one additional queue.

Q.21 Convert the following infix expressions into its equivalent postfix expressions;

(i) (A + B ↑ D) / (E - F) + G

(ii) A * (B + D) / E – F * (G + H / K)

Q.24 Devise a representation for a list where insertions and deletions can be made at either end. Such a structure is called Deque (Double ended queue). Write functions for inserting and deleting at either end.

Q.25 Execute your algorithm to convert an infix expression to a post fix expression with the following infix expression as input

A + B – C / D * E * F * G / H.

Q.26 What is the difference between a Stack and an Array?

Q.27 Write algorithm to Insert and Delete element from Linear Queue with example.

Q.28 Write an algorithm for finding solution to the Tower's of Hanoi problem. Explain the working of your algorithm (with 4 disks) with diagrams.

Q.29 What is the data structures used to perform recursion?

Q.30 What data structure would you mostly likely see in a non recursive implementation of a recursive algorithm?

UNIT-5

Q.1 Given a set of input representing the nodes of a binary tree, write a non-recursive algorithm that must be able to output the tree traversal orders.

Q.2 What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers

45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

Traverse the tree in Preorder, In-order and post-order.

Q.3 Two Binary Trees are similar if they are both empty or if they are both nonempty and left and right sub trees are similar. Write an algorithm to determine if two Binary Trees are similar.

Q.4 The degree of a node is the number of children it has. Show that in any binary tree, the numbers of leaves are one more than the number of nodes of degree 2.

Q.5 Taking a suitable example explains how a general tree can be represented as a Binary Tree.

Q.6 What is the maximum total number of nodes in a tree that has N levels? Note that the root is level (zero).

Q.7 Write the non-recursive algorithm to traverse a tree in preorder.

Q.8 Build a BST using following list of elements:

44, 30, 50, 22, 60, 55, 77, 55

Q.9 What are expression trees? Represent the following expression using a tree. Comment on the result that you get when this tree is traversed in Preorder, In-order and post-order.
(a - b) / ((c * d) + e).

Q.10 How do you rotate a Binary Tree? Explain right and left rotations with the help of an example.

Q.11 Taking a suitable example explains how a general tree can be represented as a Binary Tree.

Q.12 How many different binary trees and binary search trees can be made from three nodes that contain the key values 1, 2 & 3?

Q.13 How in-order, preorder and post-order traversals print the elements of a tree?

Q.14 Which one is faster? "A binary search of an ordered set of elements in an array **or** a sequential search of the elements" Justify.

Q.15 Write a non recursive algorithm to traverse a binary tree in in-order.

Q16 Construct a binary tree whose nodes in in-order and preorder are given as follows:

In-order: 10, 15, 17, 18, 20, 25, 30, 35, 38, 40, 50.

Preorder: 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50.

Q.17 Given the following in-order and preorder traversal reconstruct a binary tree

In-order sequence D, G, B, H, E, A, F, I, C

Preorder sequence A, B, D, G, E, H, C, F, I

Q.18 Make a BST for the following sequence of numbers. 45,32,90,34,68,72,15,24,30,66,11,50,10
Traverse the BST created in Preorder, In-order and Post-order.

Q.19 What is a Binary Tree? What is the maximum number of nodes possible in a Binary Tree of depth **d**. Explain the following terms with respect to Binary trees

(i) Strictly Binary Tree
(ii) Complete Binary Tree
(iii) Almost Complete Binary Tree.

Q.20 Construct a complete binary tree with depth 3 for this tree which is maintained in memory using linked representation.

Q.21 Prove the hypothesis that "A tree having 'm' nodes has exactly (m–1) edges or branches".

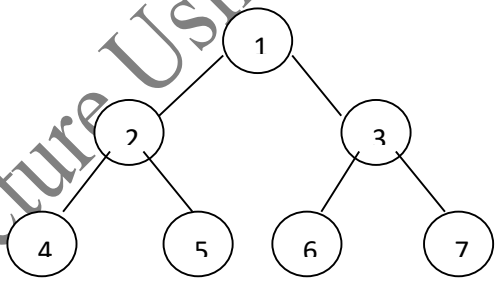
Q.22 Construct the binary tree for the following sequence of nodes in preorder and in-order respectively.
Preorder: G, B, Q, A, C, K, F, P, D, E, R, H
In-order: Q, B, K, C, F, A, G, P, E, D, H, R

Q.23 What is a height balanced tree? Explain how the height is balanced after addition/deletion of nodes in it?

Q.24 Let a binary tree 'T' is in memory. Write a procedure to delete all terminal nodes of the tree.

Q.25 Draw the expression tree of the following In-order expression. Convert it in to Pre-order and Post-order expressions.
(a + (b – c)) * ((d – e) / (f + g – h))

Q.26 Consider following tree



If the Post order Traversal gives a, b, -, c, d, *, + then, what will be the label of the nodes 1, 2, 3, 4, 5, 6, 7?

UNIT-6

Q.1 Draw the complete undirected graphs on one, two, three, four and five vertices. Prove that the number of edges in an n vertex complete graph is n(n-1)/2.

Q.2 What is a spanning Tree?

Q.3 What are the different ways of representing a graph? Represent the following graph using Linked representation.

Q.4 What are the different ways of representing a graph? Represent the following graph using Memory Representation.

Q.5 Write an algorithm which does depth first search through an un-weighted connected graph. In an un-weighted graph, would breadth first search or depth first search or neither find a shortest path tree from some node? Why?

Q.6 Which are the two standard ways of traversing a graph? Explain them with an example of each.

Q.7 Consider the following specification of a graph G
V(G)=(1,2,3,4)
E(G)=((1,2), (1,3), (3,3), (3,4), (4,1))
(i) Draw an undirected graph.
(ii) Draw its adjacency matrix.

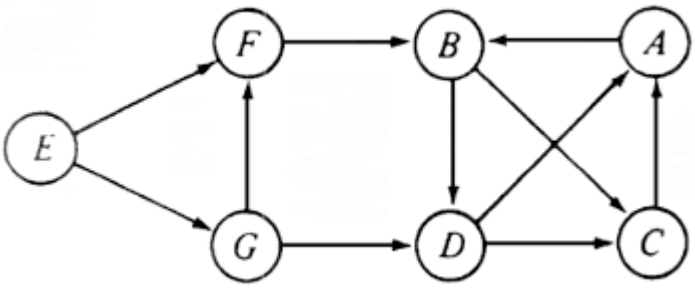
Q.8 Explain Dijkstra's algorithm for finding the shortest path in a given graph.

Q.9 Define graph, adjacency matrix, adjacency list, sparse matrix,

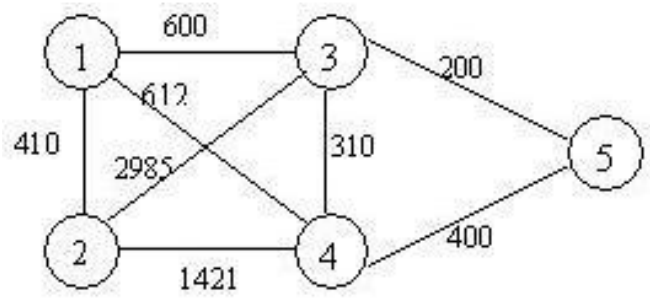
Q.10 Explain various graph traversal schemes and write their merits and demerits.

Q.11 Write short notes on the following:
(i) Threaded binary trees.
(ii) Graph traversal.
(iii) Conversion of forest into tree.

Q.12 For the given graph, draw the DFS and BFS?



Q.13 Convert the given graph with weighted edges to minimal spanning tree.



Q.14 Explain BFS with example.

Q.15 Explain DFS with example.

Q.16 Explain POSET and its property.

Q.17 Consider vertex **1** and **9** as the start and destination vertex. Find out shortest path among them by Dijkshtra's Algorithm.(Fig. 17)

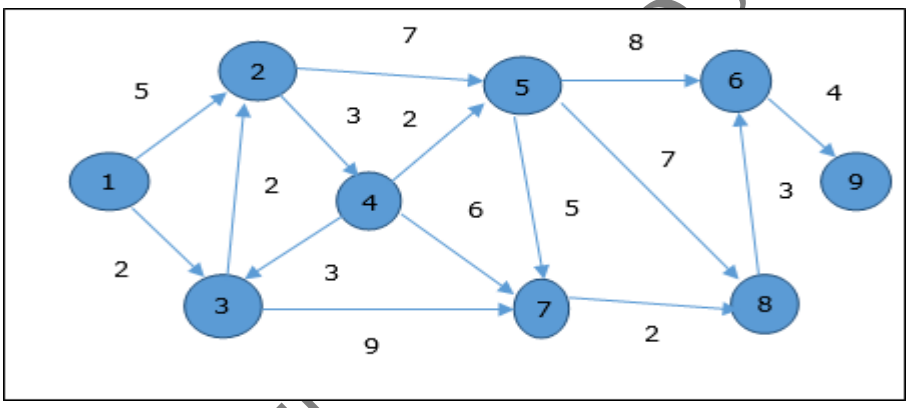


Fig. 17

Q.18 Consider the following graph G (fig 5.1).

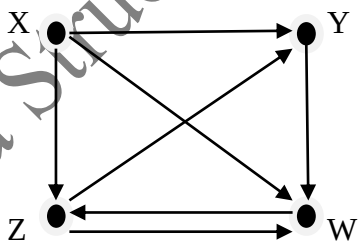


Fig 5.1

i) Find out simple paths from X to Z .
ii) Find all Simple paths from Y to Z.
iii) Find In-degree of all nodes
iv) Find Out-degree of all nodes.

Q.19 Consider the following graph G (fig 5.1).
Suppose the nodes are stored in memory in an array DATA as X, Y, Z, W

i) Find the adjacency matrix A of the graph G.
ii) Find the path matrix P of G using powers of the adjacency matrix A.
iii) Is G Strongly Connected?

Q.20 Consider the following graph G (fig 5.1) and obtained its adjacency matrix A. find the path matrix P of G using Warshall's algorithms. Like P0, P1, P2, P3, P4.

Q.21 Consider the following graph G (fig 5.1) and obtained its adjacency matrix A. find the Shortest Path Matrix of G using Warshall's algorithms. Like Q0, Q1, Q2, Q3, Q4.

Q.22 Find out Minimum Spanning Tree using Kruskal's Algorithm for the considering following graph. (Fig. 22)

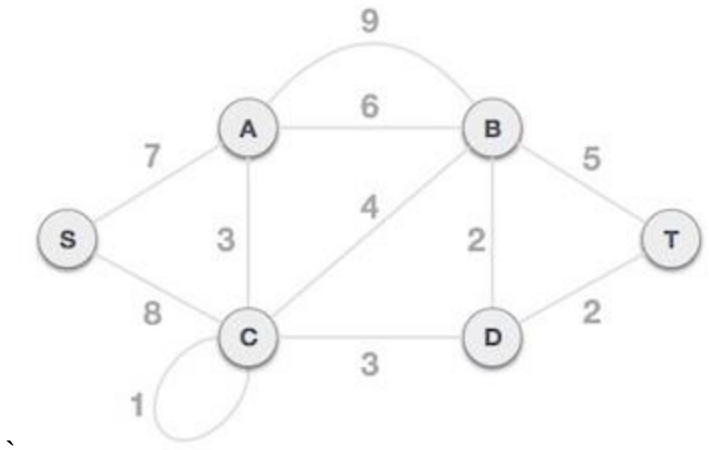


Fig. 22

Q.23 Find out Minimum Spanning Tree using Prim's Algorithm by considering graph in fig. 22

Q.24 Find out Minimum Spanning Tree using Kruskal's and Prim's Algorithm by considering graph in fig. 17