

ASSIGNMENT – I (UNIT – I)

- 1 a) Write in detail about polynomial representation using Abstract Data Type?
b) Explain any one method to calculate memory location for different position in two-dimensional array?
- 2 a) Describe how an array can be effectively used to store a sparse matrix?
b) Explain about polynomial representation with a suitable example?
- 3 a) Differentiate array and linked list representation of Stack?
b) Explain about different kinds of ADTs with suitable examples?
- 4 a) Explain order-list matrix. What are the benefits of the order-list matrix?
b) Distinguish between the row major order and column major ordering of an array?
- 5 a) Explain Oops Concepts?
b) Discuss about representation of polynomial using Abstract Data Type?
- 6 a) With an example explain the procedure of transposing a Sparse matrix?
b) Discuss about Array as an Abstract Data Type?
- 7 a) Explain about Polymorphism in C++ with suitable examples?
b) Discuss about Sparse matrix representation with an example?
- 8 a) Differentiate between constructor and destructor?
b) Discuss about the Polynomial Addition using Array ADT?
- 9 a) Explain about addition of two polynomials and write a program using arrays?
b) Explain about ADTs with suitable examples.
- 10 a) What is an array? Explain array types.
b) Which operation is supported by an array ADT?
c) Write formula to calculate address of elements in one-dimensional array?
d) How to pass array as an argument to function?
e) Define Abstraction?
f) Define Encapsulation?
g) What is a copy constructor?
h) Define Sparse matrix?
i) What is sparse Matrix? Discuss.
j) Define Abstract Data Type.

ASSIGNMENT – II (UNIT – II)

- 1 a) Explain in detail about representation of Queues using array implementation?
- 2 a) What is priority queue? Explain the implementation of Priority queue? Write an algorithm for operations Priority queues with an example?
b) Perform enqueue and dequeue operations in a queue? How do they differ from circular queue operations? Explain.
- 3 a) Evaluate following expressions: i) $10+3-2-8/2*6-7$ ii) $(12-(2-3)+10/2+4*2)$
b) Write a C++ program to evaluate postfix expressions for the above?
- 4 a) Represent container class using templates and give example C++ program for the container class?
b) How to convert infix expression to postfix expression? Explain the program with example.
- 5 a) Write a C++ program to pop an element from the stack?
b) Explain different types of inheritances available in C++?
- 6 a) Write a program to push an element into a stack?
b) Implement container classes using templates?

- 7 a) Write a C++ program to insert an element in a Queue?
b) Write an algorithm to evaluate postfix expression?
- 8 a) Discuss about Stack ADT?
b) What are container classes? Explain with a sample program.
- 9 a) Represent container class using templates and give example C++ program for the container class?
b) Differentiate array and linked list representation of Stack.
- 10 a) Give real world example of stack? Define linear probing?
b) Elaborate the application on stack?
c) Define Circular Queue? Write algorithm to insert element into circular queue?
d) Convert the following infix expression to postfix expression: $((a+b)/d-((e-f)+g)$
e) Convert the following expression into postfix $A-B*C+D-E+F/G-H$
f) Where operator Stack is used?
g) What are container classes?
h) What are the uses of templates in C++?
i) What is meant by PUSH and POP on Stack? What is State of the STACK after insert 12, 75, 04, 100, 23, POP, POP, Insert 11, POP?

ASSIGNMENT – III (UNIT – III)

- 1 a) Write a program to insert an element in between two nodes to a double linked list?
b) Explain the mechanism of deleting an element from front, rear and any of the Single Linked List?
- 2 a) Write pseudo code to add node at the end and middle positions in circular linked list?
b) Write a C++ program for circular linked list traversal?
- 3 a) Write an algorithm to delete duplicates in a linked list?
b) Explain how linked list can be used for representing polynomials using a suitable example?
- 4 a) Explain array and linked representation of Sparse matrix?
b) Compare the performance of linked lists, stack and queues with their sequential counterparts?
- 5 a) Write a C++ program to write a recursive function to print reverse of a linked list?
b) Write a C++ program for quick sort on singly linked list with an example.
- 6 a) Write a C++ program to insert an element at last position into a single linked list?
b) Explain about equivalence class?
- 7 a) Discuss about implementing chains with templates?
b) Discuss about implementation of queues using linked list?
- 8 a) Write a C++ program to count the number of elements present in a Single linked list?
b) Discuss about chain manipulation operations?
- 9 a) How chains are represented in C++?
b) Discuss about Linked Queues?
- 10 a) Write a C++ function length to count the number of nodes in a chain. What is the time complexity of your function?
b) Explain about Iterators in C++?
- 11 a) Define sparse matrix with example?
b) What do you mean by amortized analysis?
c) What is the difference between circular linked list and linear linked list?
d) What is the node structure for Circular linked list?
e) What are chain iterators?

- f) Define a node of Single linked list in C++?
- g) With a neat diagram represent 3 elements (**10, 15, 19**) in double linked list?
- h) With a neat diagram represent 4 elements (**21, 30, 12, 11**) in Circular linked list?
- i) What are the steps to insert a new item at the head of a double linked list?

ASSIGNMENT – IV (UNIT – IV)

- 1 a) With the help of diagrams construct a Binary Search Tree (BST) with the following keys: 86, 12, 42, 69, 38, 57, 74, 6, 49 and 71. Also delete 42 from the constructed BST?
b) Write a function to find an element and its position in a binary tree?
- 2 a) Describe the following terms with suitable examples: i) Binary Tree ii) Complete Binary Tree iii) Strictly Binary Tree iv) Almost Complete Binary Tree.
b) Write a short notes on various operations of the threaded binary tree?
- 3 a) Describe the following terms used in binary trees: i) Siblings ii) Height iii) Level
b) What is a threaded binary tree? Explain insertion and deletion operations on it with an example.
- 4) b) Write Recursive Algorithms for Pre-order, In-order and Post-order traversals? Explain.
- 5 a) Explain with an example how to delete an element to maxheap?
b) Explain with an example how to insert an element to maxheap?
- 6 a) If number of elements in a binary search tree are N. Give two sample binary search trees where the search time is proportional to i) $\log N$ ii) N
b) Explain with examples different cases of deletion of elements in a binary search tree?
- 7 a) Create max heap for the following elements (**20, 12, 14, 3, 52, 15, 139, 27, 190**).
b) What are Tree iterators? Explain.
- 8 a) Create binary search tree for the following elements (**23, 12, 45, 36, 5, 15, 39, 2, 19**)? Discuss about the height of the above binary search tree?
b) What is a threaded binary tree? Give an example with neat diagram of inorder traversal of threaded binary tree.
- 9 a) What are the properties of a binary tree?
b) Write an algorithm to traverse the given binary tree in inorder? Explain with an example?
- 10 a) Write an algorithm for in-order traversal of a binary tree. Explain with an example.
b) What is Binary Tree? What are the operations of Binary tree? Discuss.
- 11 a) Write about internal & external nodes and siblings with example?
b) What is the maximum number of nodes in a binary tree of depth k?
c) Trace the binary tree of in-order traversal: **BFGPRSTWYZ**?
d) Differentiate full binary tree & complete binary tree.
e) Define Max heap?
f) Can we have a binary tree whose postorder and preorder traversal same? Give example?
g) Can we have a binary tree whose inorder and postorder traversal same? Give example?
h) Can we have a binary tree whose inorder and preorder traversal same? Give example?
i) Draw the binary search tree for the following: 40, 67, 71, 33, 91, 56, 22, 32

ASSIGNMENT – V (UNIT – V)

- 1 a) Write the advantages of using BFS over DFS or using DFS over BFS? What are the applications and downsides of each?
- 2 b) How to solve All pairs shortest path algorithm with help of optimization function? Write the program and explain.

- 3 a) The following network has 10 vertices A, B,J. The numbers on each edge represents the distance in miles between pairs of vertices. i) Use Kruskal's Algorithm to find the minimum spanning tree for the network? ii) State the length of the spanning tree?
b) Write an algorithm to traverse a graph using Depth first search?
- 4 a) Define graph and explain how graphs can be represented in adjacency matrix and adjacency list?
b) What is Graph? Explain two representation methods of graph? Brief insertion and deletion of vertices and edges of the graph?
- 5 a) Write an algorithm to traverse a graph using breadth first search?
b) Discuss about different ways of representing Graphs in memory?
- 6 a) Write an algorithm to traverse a graph using Depth first search?
b) Explain about All pairs shortest path algorithm?
- 7 a) Explain Kruskal Algorithm?
b) With an example explain Single Source shortest path algorithm?
- 8 a) Explain Prim's Algorithm?
b) What is Spanning tree? Explain about Depth first and Breadth first Spanning trees?
- 9 a) Write an algorithm for minimum cost spanning tree using Prim's Algorithm.
b) What is Transitive Closure? Explain.
- 10 a) Elaborate connected components of a graph?
b) What is Graph? Give adjacency list representation of graph?
c) What are the applications of Graphs?
d) What is Graph? Give adjacency list representation of graph?
e) Define Spanning tree?
f) What are connected components?
g) Define Bi Connected components?
h) What is an Articulation point?
i) What are the applications of Graphs?

ASSIGNMENT – VI (UNIT – VI)

- 1 a) Sort the sequence 8, 1, 4, 1, 5, 9, 2, 6, 5 by using insertion sort. And also explain the program.
b) Write about linear probing and quadratic probing? Discuss what are the merits and demerits of each technique.
- 2 a) An array contains N numbers and you want to determine whether two of the numbers sum to a given number K. For example, if the input is 8, 4, 1, 6 and K is 10, the answer is yes (4 and 6). A number may be used twice. i) Give an $O(N^2)$ algorithm to solve this problem ii) Give an $O(N \log N)$ algorithm to solve this problem.
- 3 a) How Prim's algorithm is efficient on sorting data? Explain with an example?
b) Rearrange the following numbers using quick sort procedure 42, 12, 18, 98, 67, 83, 8, 10, 71.
- 4 a) Explain the algorithm for QUICK Sort (partition exchange sort) and give a suitable example?
b) Explain the HEAP SORT algorithm by tracing the following elements stepwise 3,5,9,7,1,4,6,8,2.
- 5 a) Write a C++ program to sort the following elements using Recursive Merge Sort?
b) Trace the above program for the following elements?
12, 25, 5, 9, 1, 84, 63, 7, 15, 4, 3
- 6 a) Write a C++ program to sort the following elements using Insertion Sort?
b) Trace the above program for the following elements?
65, 6, 54, 63, 56, 61, 14, 39, 28, 16, 30.

- 7 a) Write a C++ program to sort the following elements using Quick Sort?
b) Trace the above program for the following elements?
66, 5, 45, 36, 65, 15, 39, 66, 56, 55
- 8 a) Write a C++ program to sort the following elements using Heap Sort?
b) Create Heap for the following elements and then sort them.
(13, 102, 405, 136, 15, 105, 390, 432, 28, 444)
- 9 a) Explain the algorithm for QUICK sort (partition exchange sort) and give a suitable example.
b) Demonstrate the insertion sort results for each insertion for the following initial array of elements.
25 6 15 12 8 34 9 18 2
- 10 a) Write down complexity of bubble sort and in which situation bubble sort should be preferred?
b) Write down complexity of selection sort and in which situation bubble sort should be used?
c) What are the merits and demerits of binary search?
d) Write down procedure for bubble sort?
e) Give the Best case, Average case, Worst case time complexity of Recursive Merge sort?
f) Give the best case, Average case, Worst case time complexity of Insertion sort?
g) Give the best case, Average case, Worst case time complexity of Quick sort?
h) Give the best case, Average case, Worst case time complexity of Heap sort?