

Question Bank - Data Structure (S.Y.B.Sc. I.T. SEM III 2023-2034)

UNIT – 1

- 1) What is data structure? Explain the categories in which data structure can be divided.
- 2) Define an algorithm? What are the characteristics of an algorithm?
- 3) Define an array. Give its advantages and disadvantages?
- 4) Describe various types of a dimensional array with its memory representation.
- 5) Explain various types of an array with an example.
- 6) List and explain any one asymptotic notation used in data structures.
- 7) Write a note on a sparse matrix?
- 8) Short note on Big O notation and Big Omega notation?
- 9) Explain a three dimensional array with an example.
- 10) State the different types of data type.
- 11) Explain operations associated with an array.
- 12) Explain the sort operation of an array with an example.
- 13) Short note on insertion and deletion operation in array.
- 14) What are the properties of an algorithm?
- 15) What is Abstract Data Type? Explain with an example.
- 16) Calculate a 2 dimensional array $M[4 \dots 7, -1 \dots 3]$. It requires 2 bytes to store each element. Calculate the address of $M[6][2]$. Given base address 100.
- 17) Consider a 3 dimensional array $M[2 \dots 8, -4 \dots 1, 6 \dots 10]$. Assuming the base address is 200, size of the element is 4. Find the location $A[5, -1, 8]$.
- 18) Consider a 1 dimensional array $M[-50 \dots 50]$, base address is 999, size of the element is 10, find address of $A[49]$.

UNIT -2

- 1) Explain a linked list with its memory representation.
- 2) Describe a singly linked list with its structure.
- 3) How insertion and deletion operations are performed on a singly linked list.
- 4) List and describe operations on a singly linked list.
- 5) Explain a doubly linked list with its memory representation.
- 6) Give the overview of operations on a doubly linked list.
- 7) Explain how to reverse a singly linked list.
- 8) How to merge two linked lists together.
- 9) Explain Circular linked list with example.
- 10) Write a note on a Header linked list.
- 11) How will you represent a polynomial using a linked list?
- 12) Write a short note on storage of sparse arrays.
- 13) How to perform an addition of polynomials using a linked list.
- 14) Explain how to copy a linked list into two.

- 15) Explain how to split a linked list into two.
- 16) Explain traversing and insertion operation in a doubly linked list.
- 17) Explain various applications of a circular linked list.
- 18) Describe various types of linked lists.

UNIT - 3

- 1) What are the operations performed on a stack?
- 2) Define stack. Give its memory representation.
- 3) Explain infix, postfix and prefix with an example.
- 4) Write a short note on recursion with its types.
- 5) Explain queue with its memory representation.
- 6) Write a short note on queue operations.
- 7) Explain a circular queue?
- 8) Explain enqueue and dequeue.
- 9) a) Conversion of infix to prefix $(d-c)*(b-a)$
b) Conversion of postfix to infix $ab+cd-*$
- 10) Write a short note on the Priority queue.
- 11) Give any five applications of stack.
- 12) Explain link list representation of queue.
- 13) Explain array representation on queue.
- 14) State the various types of queue and describe them.
- 15) What is the priority queue? Explain it.
- 16) How is the evaluation of arithmetic expressions done with the help of a stack? explain.
- 17) Explain various applications of the stack.
- 18) Define queue. Explain its operations to add and remove the elements.

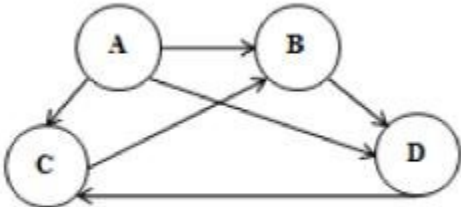
UNIT - 4

- 1) Write an algorithm to sort an array using bubble sort
- 2) Sort following elements using selection sort 15, 20, 10, 30, 50, 18, 5, 45
- 3) Write a sequential search algorithm.
- 4) Sort following elements using merge sort 40, 2, 1, 43, 3, 65, 0, -1, 58, 3, 42, 4
- 5) Write a binary search algorithm.
- 6) Define Binary tree. What are its properties?
- 7) Draw the min heap and max heap for the following data
35 33 42 10 14 19 27 44 26 31
- 8) Explain algorithm for preorder traversal of a binary tree.
- 9) Explain algorithm for inorder traversal of a binary tree.
- 10) Explain algorithm for post order traversal of a binary tree.
- 11) What is an AVL tree? Explain its balancing with example
- 12) Elaborate Red Black Tree.

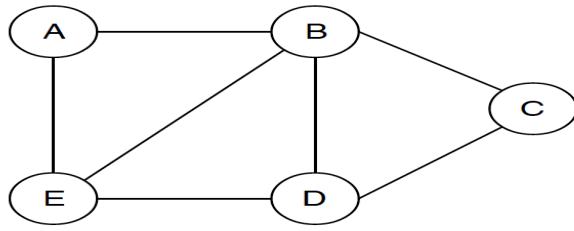
- 13) Explain the Huffman algorithm with the help of a suitable example.
- 14) Define heap. Explain its types.
- 15) Explain memory representation of binary tree
- 16) Explain any two operations of binary tree
- 17) What is RBT? Give its operations
- 18) Write an algorithm to sort an array using insertion sort.

UNIT - 5

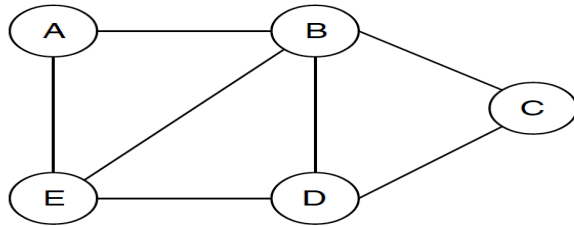
- 1) What are hash functions and a hash table? Explain any method of hash function.
- 2) Define
 - a) graph b) indegree c) outdegree d) connected graph, e) cyclic graph
- 3) Write (BFS) breadth first search algorithm
- 4) Write DFS algorithm
- 5) Explain adjacency matrix representation of a graph
- 6) Explain adjacency list representation of a graph
- 7) State the various applications of graph
- 8) Write a short note on linear probing
- 9) Explain following techniques
 - a) Quadratic hashing
 - b) Double hashing
- 10) List different hashing methods. Explain with example any two of them.
- 11) What is a collision? Explain how it is resolved.
- 12) Explain different hashing techniques.
- 13) Give the adjacency matrix and adjacency list of following (A is a start)



- 14) What is a spanning tree? Give an example.
- 15) Find the BFS of the following graph (Consider A as a starting point)



16) Find the DFS of the following graph.(Consider A as a starting point)



17) Differentiate between BFS and DFS.

18) State and describe the applications of a graph.