# Data Structure

2 Marks

i. Define best case, average case and worst case for analyzing the complexity of a

program.

ii. Differentiate between binary search tree and a heap

iii. Write the condition for empty and full circular queue

iv. What do you understand by tail recursion?

v. Construct an expression tree for the following algebraic expression:

a. (a - b) / ((c \* d) + e)

vi. Differentiate between internal sorting and external sorting

vii. What are the advantages and disadvantages of array over linked list?

viii. Write an algorithm for Breadth First Search (BFS) traversal of a graph

ix. In a complete binary tree if the number of nodes is 1000000

x. What will be the height of complete binary tree

xi. Which data structure is used to perform recursion and why?

xii. Define a sparse matrix

xiii. Suggest a space efficient representation for space matrices

xiv. List the advantages of doubly linked list over single linked list

xv. Give example of one each stable and unstable sorting techniques

xvi. Write advantages of AVL tree over Binary Search Tree (BST)

xvii. What is tail recursion? Explain with a suitable example

xviii. Write different representations of graphs in the memory

xix. Draw the binary search tree that results from inserting the following numbers in

sequence starting with 11: 11, 47, 81, 9, 61, 10, 12

xx. Convert the infix expression (A+B) \*(C-D) $E\*F to postfix

xxi. Give the answer without any spaces

xxii. Rank the following typical bounds in increasing order of growth rate:

a. O(log n), O(n4 ), O(1), O(n2 log n)

xxiii. What are the various asymptotic notations?

xxiv. Why are parentheses needed to specify the order of operations in infix expressions

but not in postfix operations?

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xxv. How the choice of pivot element effects the running time of quick sort algorithm?

xxvi. What are the 2 different forms of hashing?

xxvii. What is the significance of binary tree in Huffman algorithm?

xxviii. What is the number of edges in a regular graph of degree d and n vertices

xxix. Write an algorithm to obtain the connected components of a graph

Unit I

7 Marks

 What is asymptotic notation? Explain the various Types in details

 What is complexity of an algorithm? Explain various notations used to express the

complexity of an algorithm

 What are the various asymptotic notations? Explain Big O notation

 Consider the linear arrays AAA [5 : 50], BBB [– 5 : 10] and CCC [1 : 8]

A. Find the number of elements in each array

B. Suppose base (AAA) = 300 and w = 4 words per memory cell for AAA

 Find the address of AAA [15], AAA [35] and AAA [55]

 Suppose multidimensional arrays P and Q are declared as P(– 2: 2, 2: 22) and Q(1:

8, – 5: 5, – 10 : 5) stored in column major order

i. Find the length of each dimension of P and Q

ii The number of elements in P and Q

iii Assuming base address (Q) = 400, W = 4, find the effective indices E1 , E2 , E3

and address of the element Q[3, 3, 3]

 What do you understand by sparse matrix

 What are the advantages and disadvantages of single linked list ?

 Write a C program create a Singly linkedlist

 What is meant by circular linked list ?

 What is Doubly linkedlist?

 Write difference between array and linked list

 Define data structure

 Describe about its need and types

 Why do we need a data type ?

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 What do you understand by complexity of an algorithm ? Compute the worst case

complexity for the following C code :

main()

{ int s = 0, i, j, n;

for (j = 0; j < (3 \* n); j++)

{

for (i = 0; i < n; i++)

{ s = s + i;

}

printf(“%d”, i);

}

}

Unit II

7 Marks

 What is Stack ? Discuss PUSH and POP operation in stack and write down their

algorithm

 Write a C function for array implementation of stack

 Write all primitive operations

 Write a C function for linked list implementation of stack

 Write all the primitive operations

 What do you understand by polish and reverse polish notation?

 What is recursion ? Explain

 What is recursion ? Write a recursive program to find sum of digits of the given

number

 Also, calculate the time complexity

 What is Tower of Hanoi problem ? Write the recursive code in C language for the

problem with its algorithm

 Write a recursive and non-recursive program to calculate the factorial of the given

number

 What is circular queue ? Write a C code to insert an element in circular queue

 Write all the condition for overflow

 Write an algorithm to insert and delete an item from the circular linked list

 What do you mean by priority queue & Dequeue ? Describe its applications

 Write down the condition for empty and full circular queue

 What do you understand by tail recursion? Calculate total no

 of moves in Tower of Hanoi for n=10 disks

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 Write a C program to reverse a string using stack

 Consider the following infix expression and convert into reverse polish notation

using stack A + (B \* C – (D/E ^ F) \* H)

 Consider the following arithmetic expression written in infix notation : E = (A + B)

\* C + D / (B + A \* C) + D E = A/B  C + D \* E – A \* C Convert the above

expression into postfix and prefix notation

Unit III

 What is collision ? Discuss collision resolution techniques.

 Write a short note on insertion sort. Write algorithm

 Write a short note on Selection sort. Write algorithm

 Write a short note on Bubble sort. Write algorithm

 What is quick sort ? Sort the given values using quick sort; present all

steps/iterations : 38, 81, 22, 48, 13, 69, 93, 14, 45, 58, 79, 72 10

 Use quick sort algorithm to sort 15, 22, 30, 10, 15, 64, 1, 3, 9, 2. Is it a stable

sorting algorithm? Justify

 Write an algorithm for merge sorting. Using the algorithm sort in ascending order

: 10, 25, 16, 5, 35, 48, 8 12

 Write a short note on heap sort. Write a short note on radix sort.

 Write a short note on hashing techniques.

 What do you mean by hashing and collision? Discuss the advantages and

disadvantages of hashing over other searching techniques.

 What do you mean by searching ? Explain.

 What is difference between sequential (linear) search and binary search technique

?

 What do you mean by hashing ? Discuss types of hash functions.

Unit IV

 Write the algorithm for deletion of an element in binary search tree.

 What is a threaded binary tree ? Explain the advantages of using a threaded binary

tree.

 What is Huffman tree ? Create a Huffman tree with following numbers : 24, 55,

13, 67, 88, 36, 17, 61, 24, 76 10.

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 Explain Huffman algorithm. Construct Huffman tree for MAHARASHTRA with

its optimal code

 Define AVL trees. Explain its rotation operations with example. Construct an AVL

tree with the values 10 to 1 numbers into an initially empty tree.

 Explain binary search tree and its operations. Make a binary search tree for the

following sequence of numbers, show all steps : 45, 32, 90, 34, 68, 72, 15, 24, 30,

66, 11, 50, 10.

 Define binary search tree. Create BST for the following data, show all steps : 20,

10, 25, 5, 15, 22, 30, 3, 14, 13 3.

 Write a short note on strictly binary tree, complete binary tree and extended binary

tree

 Define tree, binary tree, complete binary tree and full binary tree

 Write algorithm or function to obtain traversals of a binary tree in preorder,

postorder and inorder

 Construct a binary tree for the following :

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

Find the postorder of the tree

 What is height balanced tree ? Why height balancing of tree is required ? Create an

AVL tree for the following elements : a, z, b, y, c, x, d, w, e, v, f.

 Define a B-tree. What are the applications of B-tree ? Draw a B-tree of order 4 by

insertion of the following keys in order : Z, U, A, I, W, L, P, X, C, J, D, M, T, B, Q,

E, H, S, K, N, R, G, Y, F, O, V.

 Construct a B-tree on following sequence of inputs 10, 20, 30, 40, 50, 60, 70, 80, 90

Assume that the order of the B-tree is 3

 Difference between B+ tree index files and B-tree index files with an example

Unit V

 What do you mean by spanning tree and minimum spanning tree ?

 Write down Prim’s algorithm to find out minimal spanning tree.

 Write Kruskal’s algorithm to find minimum spanning tree.

 Explain transitive closure.

 Write the Floyd Warshall algorithm to compute the all pair shortest path. Do one

example on this algorithm.

 Write and explain Dijkstra’s algorithm for finding shortest path. Do one example

on this algorithm.

 What is a graph ? Describe various types of graph. Briefly explain few applications

of graph

 Discuss the various types of representation of graph.