PRANVEER SINGH INSTITUTE OF TECHNOLOGY, KANPUR

Odd Semester Session 2022-23 CT -I

B. Tech. III-Semester

Data Structure (KCS 301)

CO Number	Course Outcome (Please include all COs of your Course here)
CO1	Define [L1:Remember] facts, terms and basic concepts of various data structures like Array, List, Stack, Queue, Tree and Graph using C as the programming language with static or dynamic implementations.
CO2	Express [L2: Understand] the basic understanding using programming techniques for illustrating solution of problems.
CO3	Employ [L3: Apply] different operations on data structures by applying knowledge and facts gained.
CO4	Analyze [L4: Analysis] the performance of data structures and algorithms to solve problems and also to draw conclusions regarding the best data structure for the problem.
CO5	NA

Time: 1.5 Hrs. M. M. 15

Section A

Q1. Attempt all questions: **(1X3 = 3 Marks)**

a) Define Big-Theta notation used to tightly bound a function f(n). CO1

b) Name the sorting algorithm that can sort the following list in least time. A={7,9,10,12,15,18,20}. CO1

c) Define data structure and list its various types. CO1

Section B

Q2. Attempt all questions: ***(2X4 = 8 Marks)***

a i) Define the sparse matrix with an example and write the steps to store the sparse matrix efficiently. CO1

Or

ii) Define the insertion sort algorithm in steps to sort any given list. CO1

b i) Demonstrate the binary search with example. Also describe it's working in C language. CO2

Or

ii) Demonstrate the counting sort with example. Also write the program for this in C language. CO2

c i) A matrix B[10][20] is stored in the memory with each element requiring 2 bytes of storage. If the base address at B[2][1] is 2140, produce the address of B[5][4] when the matrix is stored in Column Major Order. CO3

Or

ii) A matrix A[-4:6, 3:8] is stored in the memory with each element requiring 4 bytes of storage. If the base address is 1430, produce the address of A[3][6] when the matrix is stored in Row Major Order. CO3

d i) Analyze the claim $2^n = O(2^{2n})$. CO4

Or

ii) Estimate the run time complexity of the merge sort in detail. CO4

Section C

(4X1 = 4 Marks)

Q3

i) Discuss quick sort algorithm with example. Also write the program to implement quick sort in C language. CO2

Or

ii) Illustrate the merge sort algorithm with example. Also implement merge sort in C language. CO2