MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Pre University Test (PUT) : Odd Semester 2022-23

Course/Branch : B Tech - CSE/IT/CSIT/CSAI/CSAIML/CSDS/CSIOT   Semester
: III   Subject Name   : Data Structure

Max. Marks : 100

Subject Code   : KCS 301

Time   : 180 min

CO-1 : On completion of this course, the student will be able to understand algorithm, complexity of algorithm and linear and nonlinear data structure.

CO-2: On completion of this course, the student will be able to implement array and linked list.

CO-3: On completion of this course, the student will be able to implement the concept of stack and queues using array and linked list and use of stacks to solve various problems.

CO-4: On completion of this course, the student will be able to apply the concepts of searching, sorting and hashing.

CO-5: On completion of this course, the student will be able to demonstrate the concepts of trees and graphs.

Section – A # 20 Marks (Short Answer Type Questions)
Attempt ALL the questions. Each Question is of 2 marks (10 x 2 = 20 marks)

Q. No.		COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks.
1	A	CO1	Discuss non-linear data structure? Give example. (BKL : K2 Level).
	B	CO1	Explain time space tradeoff with example. (BKL : K2 Level).
	C	CO2	List out the advantages and disadvantages of using a linked list. (BKL : K2 Level).
	D	CO2	Define an Abstract Data Type (ADT). (BKL : K2 Level).
	E	CO3	Discuss the types of queues? (BKL : K2 Level).
	F	CO3	List the applications of stacks. (BKL : K2 Level).
	G	CO4	Compare stable and unstable sorting? (BKL : K2 Level).
	H	CO4	Define separate chaining in Hashing. (BKL : K2 Level).
	I	CO5	Define a binary search tree. (BKL : K2 Level).
	J	CO5	Explain a minimum spanning tree with example ? (BKL : K2 Level).

Section – B # 30 Marks (Long / Medium Answer Type Questions)
Attempt ALL the questions. Each Question is of 6 marks (5 x 6 = 30 marks)

Q.2 (CO-1) : What is complexity of an algorithm ? Explain various notations used to express the complexity of an algorithm. (BKL : K2)

OR

Define algorithm. Explain the criteria an algorithm must satisfy. Also, give its characteristics. (BKL : K2)

Q.3 (CO-2) : Write an algorithm or C code to insert a node in doubly link list in beginning. (BKL : K3)

OR

Derive of formula to calculate address of two dimensional arrays in row major order. (BKL : K3)

Q.4 (CO-3) : Show the stack after each operation of the following sequence that starts with the empty stack: push(a), push(b), pop, push(c), push(d), pop. (BKL : K3)

OR

Show the detailed concept of the stack to evaluate the following positive expression: 6 3 2 - 5 * + 1 ^ 7 + *   (BKL : K3)

Q.5 (CO-4) : What do you mean by hashing and collision ? Discuss the advantages and disadvantages of hashing over other searching techniques. (BKL : K2)

OR

Write algorithm for quick sort. Trace your algorithm on the following data to sort the list: 2, 13, 4, 21, 7, 56, 51, 85 How the choice of pivot elements affects the efficiency of algorithm. (BKL : K2)

Q.6 (CO-5) : Define binary search tree. Create BST for the following data, show all steps : 20, 10, 25, 5, 15, 22, 30, 23, 14, 13. (BKL : K3)

OR

Explain in detail about the graph traversal techniques with suitable example. (BKL : K3)

Section – C # 50 Marks (Medium / Long Answer Type Questions)

Attempt ALL the questions. Each Question is of 10 marks.

Q.7 (CO-1) : Attempt any ONE question. Each question is of 10 marks.

a. Explain best, worst and average case analysis in this respect with an example. (BKL : K3)

b. Calculate the address of X [4, 3] in two dimensional array   X [1...5, 1....4] stored in column major order in memory. Assume the base address to be 1000 and each element requires four words of storage. (BKL : K3)

Q.8 (CO-2) : Attempt any ONE question. Each question is of 10 marks.

a. Write a program in C to delete a specific element in single linked list. Double linked list takes more space than single linked list for sorting one extra address. Under what condition, could a double linked list more beneficial than single linked list. (BKL : K3)

b. Covert the following infix expression into postfix expression by using Stack: (BKL : K3)

$$(-b+((b*b-4*a*c))^0.5)/(2*a)$$

Q.9 (CO-3) : Attempt any ONE question. Each question is of 10 marks.

a. Write an algorithm for Push and Pop operations on Stack using Linked list. (BKL : K3)

b. What is a DeQueue? Explain its operation with example? (BKL : K3)

Q.10 (CO-4) : Attempt any ONE question. Each question is of 10 marks.

a. How do you calculate the complexity of sorting algorithms? Also, write a recursive function in 'C' to implement the merge sort on given set of integers. (BKL : K3)

b. Given the input { 4371, 1323, 6173, 4199, 4344, 9679, 1989 } and a hash function of h(X) =X (mod 10) show the resulting:
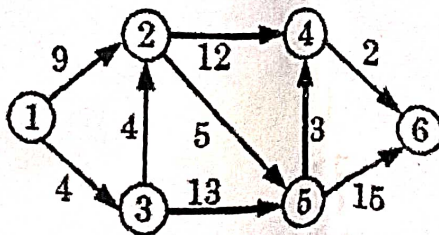
i.) Separate Chaining hash table

ii.) Open addressing hash table using linear probing (BKL : K3)

Q.11 (CO-5) : Attempt any ONE question. Each question is of 10 marks.

a. By considering vertex '1' as source vertex, find the shortest paths to all other vertices in the following graph using Dijkstra's algorithms. Show all the steps. (BKL : K3)

b. Define AVL trees. Explain its rotation operations with example. Construct an AVL tree with the values 12 to 1 numbers into an initially empty tree. (BKL : K3)