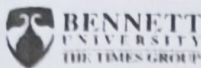


Enrolment No.:



School: School of Computer Science Engineering & Technology

MID-TERM EXAMINATION, ODD SEMESTER OCTOBER 2025

Programme: B.Tech	Semester: 3 rd
Course Code: CSET243	Course Name: Data Structures using C++
Time: 01 Hour	Max. Marks: 20

Instructions:

1. Attempt all the sections.
2. Do not write anything on the question paper except enrolment number.
3. Assume missing data suitably, if any.
4. *Paper setter can add instructions based on respective course.

CO No.	Course Outcome Statements	Bloom's Taxonomy Level
CO1	Understand the fundamentals of C++ programming, object-oriented concepts, and their role in the development of data structure-based applications.	L2 (Understand)
CO2	Apply algorithmic concepts such as recursion and asymptotic analysis to evaluate and implement linear data structures including arrays, stacks, and queues.	L3-L4 (Apply-Analyze)
CO3	Develop and manipulate non-linear data structures like linked lists, trees, heaps, and graphs to solve real-world computational problems.	L3-L5 (Apply-Evaluate)
CO4	Analyze and implement efficient searching and sorting techniques using C++ with a focus on time complexity.	L4 (Analyze)-L5 (Evaluate)
CO5	Design solutions using advanced data structures such as AVL Trees, B-Trees, and Disjoint Sets to solve optimization and hierarchical problems.	L5-L6 (Evaluate-Create)

SECTION A

(3Q x 2M = 06 Marks)

ALL QUESTIONS ARE COMPULSORY

S. No.	Approximate time to attempt Sections: Section A: 3 Questions: 10 min Section B: 2 Questions: 20 min Section C: 2 Question: 30 min	Marks	Course Outcome	BTL Level
Q1	Given an array, A[1,.....12][1.....20] with base address 200 and the size of each element is 2 Bytes in memory. Find the address of A[9][15] using row-major order.	2	CO2	L3
Q2	Consider a given code and find the output if the value of n is 10. explain the recursion process for these computations <pre>int Fun(int n) { if (n <= 1) { return n; } else { return Fun(n - 1) + Fun(n - 2); } }</pre>	2	CO2	L2
Q3	Write the Output of this code with memory visualization (draw necessarily diagram). <pre>int a, *b, **c; a=10; b=&a; c=&b; **c=a + 2*(*b); cout<<"The value of a is : "<< a.</pre>	2	CO1	L3

SECTION B

(2Q x 3M = 06 Marks)

ATTEMPT ANY TWO QUESTIONS

Q4	There are three towers, 3 disks, with decreasing sizes, placed on the first tower. You need to move all the disks from the first tower to the last tower; A large disk cannot be placed on top of a smaller disk. The remaining tower can be used to temporarily hold disks. Design an algorithmic solution to solve this problem, explain each operation with diagram, and compute and draw the number of operations needed to transfer 3 disks from source tower to destination tower?	2+1=3	CO2	L3
Q5	For a singly linked list representation, give the function to find the second largest element present in the linked list.	3	CO3	L3
Q6	<p>In a small town, there was a yearly festival where villagers showcase their talents and crafts. Each year, the villagers organize their showcase items in a specific order to make sure everything looks perfect and orderly. This year, the festival organizer, Emma, decided to use a unique method to arrange the showcase items based on their attractiveness. Emma's method of arranging items is like how Insertion Sort works. She starts by examining each item one-by-one and placing it in its correct position among the previously arranged items. Here's the sequence of items she had to arrange for the festival:</p> <p style="text-align: center;">$items = \{42, 23, 17, 13, 29, 67, 9, 1, 33, 12\}$</p> <p>Emma follows these steps for each item:</p> <ol style="list-style-type: none"> She takes the next item from the unsorted part of the list. She compares it with the items already arranged, from right to left. She places it in its correct position among the arranged items. <p>Task:</p> <ol style="list-style-type: none"> Explain Emma's Method: Describe how Emma arranges the items using her method. Explain the core concept (algorithm) of the method she uses to sort the items. Show the Sorting Process: Show the step-by-step process of how Emma arranges the items using her method. After the 5th step (iteration), what will the list of items look like. 	2+1=3	CO4	L3

SECTION-C (2Q x 4M = 08 Marks)

ATTEMPT ANY TWO QUESTIONS

Q7	<p>A circular queue of size 5 is initially empty (use the same conventions as above). Perform the operations and track the array, front, and rear after each step: Enqueue 5, Enqueue 15, Enqueue 25, Dequeue, Enqueue 35, Enqueue 45, Enqueue 55, Dequeue, Dequeue, Enqueue 65, Enqueue 75.</p> <ol style="list-style-type: none"> Show the array state and (front, rear) after each operation. State whether the queue becomes full at any point (and if so, when). Write condition for underflow and overflow using array implementation. 	1+1+2=4	CO2	L3
Q8	<p>Given the infix expression: $\{8 + 2 * (2^3) - 8 / 2\} + (5^2 - 5 * 3)$</p> <ol style="list-style-type: none"> Using a stack, convert the expression into Postfix notation with the Infix to Postfix algorithm. Evaluate the Postfix expression step by step using a stack. 	3+1=4	CO2	L3
Q9	<p>A circular-singly-linked list contains the elements: $15 \rightarrow 25 \rightarrow 35 \rightarrow 45 \rightarrow 15$ (last node points back to the first).</p> <ol style="list-style-type: none"> Write an algorithm to insert a node with value 30 after the node containing 25. Write an algorithm to delete the node containing 35. 	2+2=4	CO3	L3