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Question Paper Code : 30038

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Second Semester

Electronics and Communication Engineering

CS25C05 — DATA STRUCTURES USING C++

(Common to : Electronics Engineering (VLSI Design and Technology)/ Electronics
and Computer Engineering)

(Regulations 2025)

Time : 3 hours

Maximum : 100 marks

CO – Course Outcomes

CO1	Explain the concepts and applications of Data Structure in various engineering applications
CO2	Apply various Data Structure in real time
CO3	Develop suitable and interrupt the data in real world applications

BL – Bloom's Taxonomy Levels

(L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create)

Answer ALL questions.

PART – A (Total Marks = 40)

[Q. No. 1 to Q. No. 10 ; $10 \times 1 = 10$ Marks (Multiple Choice Questions)

Q. No. 11 to Q. No. 20; $10 \times 3 = 30$ Marks]

Q.No.	Questions	Marks	CO	BL
1.	Which variable provides an alias name to an existing variable? (A) Pointer (B) Static Variable (C) Reference Variable (D) Constant Variable	1	1	1
2.	Which keyword is used to allocate memory dynamically in C++? (A) Malloc (B) Alloc (C) New (D) Create	1	1	1

3.	The class whose members are inherited is called: (A) Parent class (B) Base Class (C) Child class (D) Both (A) and (B)	1	2	1
4.	Which keyword is used for runtime polymorphism? (A) Class (B) Friend (C) Virtual (D) Static	1	2	1
5.	The operation of inserting an element into stack is called: (A) Pop (B) Push (C) Insert (D) Add	1	3	1
6.	Polynomial addition using linked list is efficient because: (A) Uses recursion only (B) Dynamic memory allocation (C) Requires fixed size memory (D) No memory needed	1	3	2
7.	Right child of node at index i in array representation is: (A) $2i$ (B) $2i + 1$ (C) $i + 1$ (D) $i/2$	1	4	2
8.	In a binary tree, each node can have atmost: (A) 1 child (B) 2 children (C) 3 children (D) Unlimited children	1	4	1
9.	Number of comparisons in worst case of Linear Search for n elements is: (A) 1 (B) $\log n$ (C) n (D) n^2	1	5	3

10.	If an array has 1024 sorted elements, maximum comparisons in Binary Search are : (A) 10 (B) 11 (C) 512 (D) 1024	1	5	3
11.	Differentiate between the constructor and destructor in C++.	3	1	2
12.	How are class members accessed in C++?	3	1	1
13.	Define base class and derived class with an example.	3	2	2
14.	What is a pure virtual function? Give syntax.	3	2	1
15.	Define Omega (Ω) notation with an example.	3	3	2
16.	How can a stack be implemented using linked list?	3	3	3
17.	List the properties of a binary tree.	3	4	1
18.	Differentiate between directed graph and undirected graph.	3	4	4
19.	State the best case and worst-case time complexity of Linear Search.	3	5	1
20.	Which sorting algorithm is suitable for small datasets? Why?	3	5	5

PART - B (5 × 12 = 60 marks)

Q.No.		Questions	Marks	CO	BL
21.	(a)	Explain the structures and classes in C++. Compare structures and classes with examples.	12	1	4
		OR			
	(b)	Explain function overloading and operator overloading in C++. Write a C++ program to overload any one operator.	12	1	6
22.	(a)	What are virtual functions? Explain their role in dynamic binding with a suitable example.	12	2	3
		OR			

	(b)	Differentiate between composition and inheritance. Explain with real-time examples.	12	2	4
23.	(a)	Write an algorithm to convert an infix expression into postfix expression. Convert the expression. $(A + B) * (C - D) / E$	12	3	6
	OR				
	(b)	Analyze the time complexity of stack, queue, array access, and linked list insertion operations using Big-Oh notation.	12	3	4
24.	(a)	Compare adjacency matrix and adjacency list for a graph with 1000 vertices and 1500 edges. Determine which representation is memory efficient and justify with calculations.	12	4	5
	OR				
	(b)	Construct a binary tree from the following traversals and perform all traversals again: - In order : H D I B E A F C G - Preorder : A B D H I E C F G Find the height and number of leaf nodes.	12	4	6
25.	(a)	Write the Merge Sort algorithm and explain the divide and conquer approach with an example.	12	5	6
	OR				
	(b)	Explain Heap Sort algorithm with suitable example. Show heap construction and sorting steps.	12	5	3