Total number of printed pages: 2 **Programme(UG)/Semester III/UCSE306**

2023

DATA STRUCTURE USING C

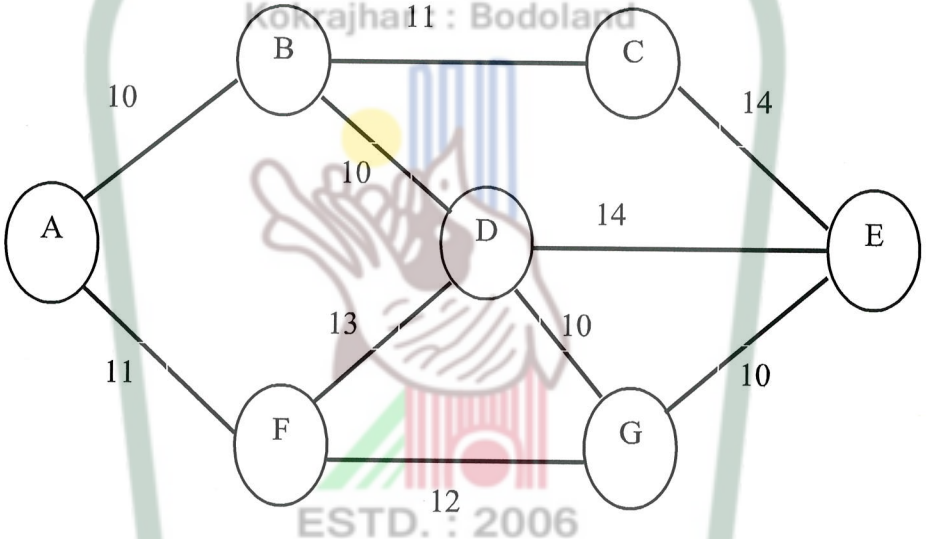
Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Define the average case time complexity? Draw the average case time complexity graph.	3+3=6
	b)	Prove that the worst case time complexity of the following function f(n) is of $O(n^2)$ where, $f(n) = 5n^2 + 7n + 2$.	4
	c)	*Define the following terms in brief:*	2*5=10
		i) Pre-order traversal	
		ii) Binary search tree	
		iii) Linear search	
		iv) Depth first search traversal	
		v) Time complexity	
2.	a)	Why worst case time complexity of bubble sort algorithm for sorting an array of n elements is $O(n^2)$? Explain.	6
	b)	Write the intermediate steps using bubble sort algorithm on the following data : 100 60 30 50 80 70 40 50 20	6
	c)	Write an algorithm for a queue to perform its operations circularly.	8
3	a)	Write the intermediate steps for quick sort while sorting the following data: 70 80 90 100 30 40 50 60	8
	b)	Write the algorithm for binary search technique.	6
	c)	Why worst case time complexity of binary search is O(log n)?	6

4	a)	Write the algorithmic steps for selection sort algorithm.	6
	b)	Apply insertion sort algorithm on the following set of data and write the intermediate steps only: 65 55 35 75 80 45 50 10 40	6
	c)	Build a binary search tree from the following data: 30 70 40 25 15 75 30 35 10 20 45 Apply in-order and post order traversal to the above tree built by you.	4+2*2=8
5.	a)	Define breadth first search (BFS) algorithm. Apply BFS traversal to the following graph showing the status of the queue during the traversal: 	3+7=10
	b)	Draw a binary tree from the following post-order and in-order traversals: Post order: E, B, F, H, I, D, G, K, C, A, In order: I, F, D, H, A, E, B, C, G, K	10
6.	a)	How a linked list is different from an array? Draw a binary tree for 10 nodes (integer data) and represent it as a doubly linked list.	2+8=10
	b)	Write an algorithm to insert an element in the first position of a singly linked list.	4
	c)	Write an algorithm to insert an element in the last position of a singly linked list.	6