PES University, Bangalore
(Established under Karnataka Act No. 16 of 2013)

UE19CS251
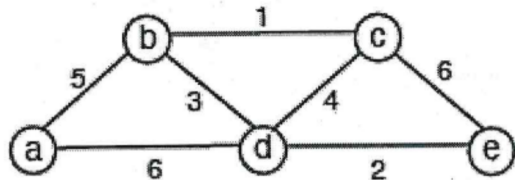
December 2021: END SEMESTER ASSESSMENT (ESA) B.Tech. IV SEMESTER

UE19CS251: DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hrs.   Answer All Questions   Max Marks: 100

1.	a)	For each of the following algorithms, indicate (i) its basic operation; (ii) whether the basic operation count can be different for inputs of the same size: a. computing the sum of n numbers b. finding the largest element in a list of n numbers c. Euclid's algorithm	6
	b)	Express the general plan for analyzing the time efficiency of Non-recursive algorithms	6
	c)	Write the recursive algorithm for Tower of Hanoi. Setup and solve its recurrence relation.	8
2.	a)	What do you mean by "bubbling up" in Bubble sort? Prove that the efficiency of Bubble sort is $O(n^2)$.	6
	b)	Write a pseudocode for a divide-and-conquer algorithm for finding the position of the largest element in an array of n numbers.	6
	c)	i) Write the non-recursive algorithm for Binary search ii) What is the largest number of key comparisons made by binary search in searching for a key in the following array? **3 14 27 31 39 42 55 70 74 81 85 93 98**	6+2
3.	a)	Construct a 2-3 tree for the list C, O, M, P, U, T, I, N, G. (Use the alphabetical order of the letters and insert them successively starting with the empty tree.)	6
	b)	Generate all permutations of {1, 2, 3, 4} by the lexicographic—order algorithm	6
	c)	Define Heap and design the algorithm for constructing HEAP using Bottom-Up Construction.	8
4.	a)	Assuming that the set of possible list values is {a, b, c, d}, sort the following list in alphabetical order by the distribution counting algorithm: b, c, d, c, b, a, a, b.	6
	b)	i) Define minimum cost spanning tree ii) Define the following functions: makeset(x), find(x), and union(x,y).	8
	c)	Apply Kruskal's algorithm to find a minimum spanning tree of the following graphs. 	6
5.	a)	Discuss on i) tight lower bound, ii) P class, iii) NP class	6
	b)	Compare Greedy approach and Dynamic programming.	6
	c)	Explain how backtracking is used for solving 4-Queens problem. Draw State space tree to generate solutions to 4-Queen's problem.	8