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PES UNIVERSITY

PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

UE17/18CS251

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

UE17/18CS251: DESIGN AND ANALYSIS OF ALGORITHMS

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

1.	a)	What is an algorithm? With a neat diagram, explain the algorithm design and analysis process.	8

	b)	Consider the following algorithm.
		Algorithm Example(n)
		//Input: A nonnegative integer n
		$S \leftarrow 0$
		for i $\leftarrow$ 1 to n do
		$S \leftarrow S + i * i$
		return S
		i). What does this algorithm compute?
		ii). What is its basic operation?
		iii). How many times is the basic operation executed?
		iv). What is the efficiency class of this algorithm?
			8

	c)	Define asymptotic notations big theta and big omega. Illustrate the definitions using graph.	4
2.	a)	Write and explain how the Brute Force String Matching Algorithm functions with an example. Give its worst case efficiency.	8
	b)	What is Divide and Conquer technique? State master theorem	6
	c)	Explain the divide and conquer strategy for multiplying two large integers.	6
3.	a)	Apply insertion sort to sort the list E, X, A, M, P, L, E in alphabetical order. At what condition the insertion sort will have worst case input.	6
	b)	Write the pseudocode for lexicographic-order algorithm. Generate all permutations of {1, 2, 3} by the lexicographic-order algorithm	8
	c)	What are the two kinds of nodes in 2-3 Tree? Explain with neat diagram	6
4.	a)	Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem for capacity W= 6. Write the optimal subset.	8
	b)	List and explain the methods of achieving time efficiency at the cost of space.	6
	c)	Apply Warshall's algorithm to find the transitive closure of the digraph defined by the following adjacency matrix	6

Item	1	2	3	4	5
Weight	3	2	1	4	5
Value	25 $	20 $	15 $	40 $	50 $

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0	1	0	0
0	0	1	0
0	0	0	1
0	0	0	0

5.	a)	Write Dijkstra's algorithm. Explain the use data structure "priority queue" in implementing the algorithm	8
	b)	Define the following: i) Class P ,ii) Class NP , iii) NP Complete problem	6
	c)	What is decision tree? Explain with three-element selection sort.	6