2122
B.E. (Information Technology)
Fifth Semester
PCIT-502: Design and Analysis of Algorithms

Time allowed: 3 Hours   Max. Marks: 50

NOTE: *Attempt* <u>*five*</u> *questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

1	a)	What is apriori analysis? Why is it important?	2x5= (10)
	b)	Explain the term 'growth of functions'.	
	c)	What is a permutation tree? Give example.	
	d)	Write an algorithm for adding n natural numbers and find the space required by that algorithm.	
	e)	Differentiate: deterministic and non-deterministic algorithms.	
PART – A			
2	a)	Define asymptotic *Big O* notation. Discuss the need of asymptotic notations and explain how it determines algorithm efficiency.	(5,5)
	b)	Solve by Master's Theorem and draw there recursion tree: (i) $T(n) = 4T(n/2) + n^3$ (ii) $T(n) = 4T(n/2) + n$	
3	a)	Describe the attributes of a problem that facilitates the application of Divide and Conquer strategy. Explain with suitable example how DAC approach improves time complexity.	(5,5)
	b)	Compare the performance of Merge sort and Quick sort algorithms. Also discuss the best and worst case time complexity of Quick sort.	
4	a)	Explain with an example the 'Greedy choice' property using fractional knapsack problem and derive various feasible solutions.	(5,5)
	b)	Explain the Prims algorithm and its time complexity for finding minimum cost spanning tree. Which specific data structures are most suitable for its implementation? For the following weighted graph, apply Prims algorithm to determine the minimum cost spanning tree:	
PART - B			
5	a)	What do you mean by Dynamic Programming? Explain the two key properties of Dynamic Programming approach and illustrate with suitable example.	(5,5)
	b)	Apply the DP approach to solve the Travelling Salesman problem. Provide detailed explanation and discuss its time complexity.	
6	a)	Solve the 8-queens problem using Backtracking strategy for algorithm design and explain the following terms with respect to the 8-queens problem: implicit constrains, explicit constraints, bounding function, time complexity	(5,5)
	b)	Consider the sum of subsets problem, where n=4, Sum=13 and wt1= 3, wt2=4,wt3=5, wt4=6. Find the solution to the problem using Backtracking. Also show the state space tree leading to the solution	
7		Explain the following terms with examples: a) Tractable and Intractable problems b) NP and NP-hard problems c) Application of Forward approach to determine shortest path in Multistage Graph Problem	(3,3,4)