

B.E. (Computer Engineering)
DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - VII) (410241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

✓ Q1) a) Compare greedy algorithmic strategy and dynamic programming strategy. [6]

b) We are given a set of 4 jobs. The deadline and the associated profit with each job is given below. [8]

Jobs	A	B	C	D
Deadline	2	1	1	2
Profit	75	40	50	35

Assume that every job takes a single unit of time. Maximize the total profit if only one job can be scheduled at a time using a greedy algorithmic strategy.

c) Comment on the statement “Greedy method always provides the optimal solution”. [3]

OR

Q2) a) Write a control abstraction for dynamic programming strategy. Comment on the time complexity of this abstraction? [7]

b) Find the binomial coefficients of $(x+y)^n$, using dynamic programming approach. [10]

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Q3) a) Consider the set A of five numbers {5,10,15,20,25}. We wish to find the subset of A such that sum of the numbers in this subset is equal to 30. Solve this problem to find the first solution using backtracking approach. Show space tree being created. [10]

b) Write a control abstraction for branch and bound strategy, Enlist few applications of branch and bound method. [8]

OR

Q4) a) Traveling salesperson has to make trip between three cities P,Q,R. The cost matrix is given below. No edge is indicated by ∞ . The tour will start from city P. Solve this travelling salesperson problem using branch and bound method. [10]

G=	P	Q	R
P	∞	4	2
Q	3	∞	4
R	1	8	∞

b) Write an algorithm for graph colouring problem using backtracking method. Let the graph consists of n nodes and that there are m-number of available colours. What is the time complexity of this algorithm? [8]

Q5) a) Prove that amortized cost per operation in k-bit binary counter is $O(1)$. [5]

b) What are intractable problems? Does traveling salesperson Problem belong to this class of problems? Justify your answer. [6]

c) Briefly explain any two methods of amortized analysis. [6]

OR

Q6) a) Explain in brief amortized analysis. Consider stack as an example and single push, single pop and multiple pop operations. Give the amortized costs for these stack operations. [9]

b) Does randomized algorithm for quick sort, improves the average case time complexity? Discuss. [4]

c) Comment on the statement "The problem of Searching an ordered list or searching an unordered list belongs to the class of tractable problems". [4]

- Q7) a) Let the hash code for the text be “4133124” and that for the pattern matching text be “124”. Use modulo arithmetic with the prime number 13 and apply Rabin-Karp string matching algorithm for this case. Show the stepwise process of matching the pattern. What is the time complexity of this algorithm? [10]
- b) Compare and contrast row-wise and block-wise approaches in multithreaded matrix multiplication with respect to: division of work, communication overhead and cache efficiency. [8]

OR

- Q8) a) Consider the text T and the pattern text P. Write a naïve string-matching algorithm. Show the stepwise process of working of this algorithm if T = “KITCHEN” and P = “HEN”. [10]
- b) Write a distributed algorithm to find the minimum spanning tree. [8]

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