

AM-107

April-2025

Int. M.Sc. (CA & IT), Sem.-VIII

Design Analysis Algorithm

Time : 2:30 Hours]

[Max. Marks : 70

1. (a) Answer the following : (Any **three**) 9
- (1) Explain the asymptotic notation. With diagram explain Big O, Big omega, Big theta.
 - (2) Define algorithm. Explain the significance of asymptotic notations in algorithm analysis. Why are they preferred over actual execution time ? Discuss the three cases of algorithm efficiency (Best Case, Average Case, and Worst Case) with an example.
 - (3) Explain the importance of space complexity and time complexity. Provide an example to illustrate both.
 - (4) Explain the classification of algorithms based on their design techniques with suitable examples
1. (b) Solve the following : 5
- (1) Prove that 4^n is $O(8^n)$.
 - (2) Prove that $x^3 + 5x$ is NOT $O(X^2)$.
2. Answer the following : (Any **two**) 14
- (1) Explain the recurrence relation. State different methods for recurrence relation.
 - (2) Write the algorithm for binary search. Do Binary Search using the array {1,3,5,7,9,11,13}. Target value is 20. Find the time complexity of binary search.
 - (3) Explain max heapify algorithm . With proper heap tree 5,10,6,9,8,7,11,13,14,16.. Search for 50.

OR

- (3) Solve the following recurrence relation in terms of n by using iteration method. $T(N)=2. T(N/2) + 1$. Find the time complexity of above relation.

3. Answer the following : (Any two) 14
- (1) Define dynamic programming. Explain the elements of the dynamic programming. With proper example explain dynamic programming.
 - (2) Consider the chain matrix A1, A2, A3, A4 with dimension given below.

A1 = 8*2
A2 = 2*6
A3 = 6*5
A4 = 5*1
 - (3) Write the algorithm for the LCS. Consider the following data for longest common sequence and find out approximate longest sequence.

X = {a b a a a b b a}
Y = { b a b b a b }

4. Answer the following : 14
- (1) Apply Huffman coding for the word “AHMEDABAD”. Give Huffman code for each symbol.

OR

- (1) Explain algorithm of quick sort. Show the quick sort on following sequence with divide and conquer
12, 18, 11, 9, 10, 16, 88, 1, 4. Pivot element is 16.
- (2) Solve the activity selection process with Algorithm.

i	1	2	3	4	5	6	7	8	9	10
Si	1	3	0	5	3	5	6	8	8	6
Fi	4	5	6	7	9	9	10	11	15	17

5. Answer the following : 14
- (1) Explain the Spurious hit in Rabin Karp algorithm. Find out how many time it happens in the text Text = {81925946544} and pattern = 46.

OR

- (1) Explain N, NPC and NP Hard classes with example.
- (2) Explain optimal Binary search tree with example.

OR

- (2) Explain the Vertex cover problem and explain its significance.