



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2023

CMSACOR08T-COMPUTER SCIENCE (CC8)

DESIGN AND ANALYSIS OF ALGORITHM

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

GROUP-A

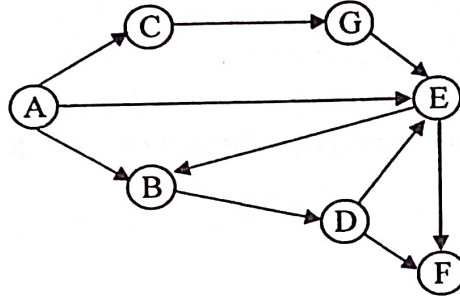
1. Answer any **four** questions from the following: 2×4 = 8
- (a) Define class P and NP.
 - (b) $T(n) = 5n^2 + 2n$, what is the worst case complexity?
 - (c) Define big-O notation.
 - (d) Define algorithm.
 - (e) State Master's theorem.
 - (f) What is dictionary search?
 - (g) Why complexity analysis is important for an algorithm?

GROUP-B

Answer any **four** questions from this group 8×4 = 32

2. (a) Write an algorithm for linear search and analyze the algorithm for its time complexity. 3
- (b) Explain a partition exchange sorting algorithm and trace the algorithm for $n = 8$ elements: 24, 12, 35, 23, 45, 34, 20, 48. 3
- (c) Drive the worst case time complexity of algorithm (b). 2
3. (a) Define decision tree. Suppose that you are given three different weights P, Q and R . Draw a decision tree to compare the weights in descending order. 2+1
- (b) Define Greedy Knapsack. Find the optimal solution of the knapsack instance $n = 7$, $M = 15$, $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$. 1+4

4. (a) Compare and contrast between BFS and DFS. 3
- (b) For the following graph find the BFS and DFS traversal sequences. Clearly mention the steps. Consider that node A is your starting node. $2\frac{1}{2}+2\frac{1}{2}$



5. (a) Define heap. What are the minimum and maximum numbers of elements in a heap of height h ? $2+(1+1)$
- (b) Justify the running time of the *Quick Sort* algorithm in the worst and best case with suitable assumption. 4
6. (a) An algorithm selects the maximum from an array of n integers to place it at the first position. Then select the next maximum to place at the next position. The process goes on till the input list becomes empty. Write an algorithm to implement the same and determine the time complexity of the algorithm. 4
- (b) Why is bubble sort generally considered for small numbers of records? 2
- (c) What do you mean by Counting sort? Give example. 2
7. (a) Explain the Prim's algorithm to compute MST of an weighted graph. 3
- (b) What makes MST greedy in nature? 2
- (c) Compute the time complexity achieved in Kruskal's and Prim's Algorithm to identify MST of an weighted graph. 3
8. (a) Distinguish between Dynamic programming and Greedy method. 2
- (b) Explain how Matrix-Chain multiplication problem can be solved using dynamic programming with suitable example. 6

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