2024
B.A./B.Sc.
Fourth Semester
CORE – 8
COMPUTER SCIENCE
Course Code: CSC 4.11
(Design & Analysis of Algorithms)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Define algorithm. What is correctness of algorithm? How can you ensure the correctness of an algorithm? 1+1+5=7
   (b) Explain computational complexity of an algorithm. How does it affect the efficiency of an algorithm? 4+3=7

2. (a) Define pseudocode. How is it different from algorithm? What are the advantages of using a pseudocode? 1+3+3=7
   (b) What is asymptotic analysis of algorithm? Explain the types of algorithm analysis. 1+6=7

UNIT–II

3. (a) Explain divide and conquer strategy for algorithm design with an example. 7
   (b) What are the main characteristics of greedy algorithm? Give examples of problems where greedy approach would be appropriate. 5+2=7

4. (a) Explain the main design techniques used in algorithm. 8
   (b) What are the advantages and disadvantages of dynamic programming? 6

UNIT–III

5. (a) Write the function definition for count sort method. 6
   (b) State some differences between linear search and binary search methods. 5
   (c) Sort the following elements in an array in ascending order using selection sort method: 3

78	12	45	34	53

6. (a) Write down the best case and worst case time complexities of the following algorithms: 2×5=10
   (i) Binary search
   (ii) Bubble search
   (iii) Merge sort
   (iv) Bucket sort
   (v) Quick sort
   (b) Write the function definition for insertion sort method. 4

UNIT–IV

7. (a) Define decision trees. 2
   (b) What are the rules that red-black trees follows? 5
   (c) Create an R-B tree by inserting the following sequence of numbers: 13, 14, 6, 4, 34, 25, 23, 20 7

8. (a) What is meant by amortized analysis? 2
   (b) Explain the process of deletion in red-black trees with an example. 6
   (c) What are the advantages and disadvantages of red-black trees? 6

UNIT–V

9. (a) Define graph algorithm. Why are graph algorithms important? 1+2=3
   (b) Explain the advantages of BFS algorithm. 4
   (c) Discuss the applications of DFS in solving graph-related problems. 7

10. (a) What is a minimum spanning tree? Explain any one algorithm that is used to find MST for a connected, undirected graph. 1+6=7

(b) What do you understand by single source shortest path (SSSP)? Using Dijkstra's algorithm find the SSSP for the directed graph given below: 1+6=7