2023
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 <u>five</u> *questions, taking* <u>one</u> *from each unit.*

UNIT–I

1. (a) What is the purpose of using an algorithm? Explain the characteristics of an algorithm. 2+5=7
   (b) What is the relation between design and analysis of algorithm? Explain the term computational complexity. 1+6=7

2. (a) What do you understand by correctness of algorithm? Differentiate between algorithm and pseudocode. 1+6=7
   (b) What is the need for analysis of algorithm? Explain the three types of algorithm analysis. 4+3=7

UNIT–II

3. (a) Explain any one algorithm that uses the divide and conquer technique. 7
   (b) What is dynamic programming? 2
   (c) Consider a knapsack with capacity W = 25, the profit and weight of the items are as follows:

Item	A	B	C	D
Profit	24	18	18	10
Weight	12	8	10	7

   Use greedy method to solve the problem so that optimum profit is gained while total weight of the knapsack is <=25. (use profit/weight ratio) 5

4. (a) Distinguish between iterative technique and divide and conquer technique for designing algorithm. 4

   (b) Using knapsack problem as an example, explain how you can solve the problem using greedy method and dynamic programming. 10

UNIT–III

5. (a) What is a sorting algorithm? List the different types of sorting algorithm. 1+2=3

   (b) What do you understand by median and order statistics? 4

   (c) Write a program to illlustrate radix sort and explain computational complexity of radix sort? 5+2=7

6. (a) What is a searching algorithm? List the different types of searching algorithm. 1+3=4

   (b) Write program to compare insertion and bubble sort. 10

UNIT–IV

7. (a) What are decision trees? How is a red-black tree different from other types of trees? 2+2=4

   (b) What do you understand by amortized analysis? What is the need for such analysis? 2+1=3

   (c) Write the algorithm for searching process in red-black trees. Explain with example. 4+3=7

8. (a) What are the properties of a red-black tree? 6

   (b) Create a red-black tree by inserting the following sequence of numbers: 10, 18, 7, 15, 16, 30, 25, 40, 60 8

UNIT–V

9. (a) What are graph algorithm? Write some applications of graph algorithms. 1+4=5

   (b) Explain spanning tree with an example. 9

10. (a) Why are graph algorithms important? 2

    (b) What do you understand by minimum spanning trees? 2

    (c) Compare breadth first search and depth first search with an example. 10

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