



ST. FRANCIS DE SALES COLLEGE

A FRANSALIAN INSTITUTE OF HIGHER EDUCATION **AUTONOMOUS**

NAAC A GRADE • AFFILIATED TO BANGALORE UNIVERSITY • AICTE APPROVED • 2(F) & 12 (B) RECOGNITION OF UGC • ISO 9001:2015 CERTIFIED
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END SEMESTER EXAMINATION – APRIL/MAY 2026

COMPUTER SCIENCE – IV SEMESTER BCA

25BCA44 – DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours

Max. Marks: 80

Instruction: Answer should be written completely in English.

SECTION - A

Answer any **FIVE** questions. Each question carries **TWO** marks.

(5X2=10)

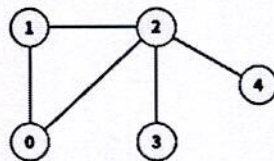
1. Define an algorithm. Discuss any two characteristics of an algorithm.
2. Give order of growth of a function in a table or show it graphically.
3. Define pivot element in Quick Sort. What will be the pivot or key element for the following:
18, 5, 24, 12, 32.
4. What is meant by Lower Bound in sorting algorithms?
5. What is Transitive closure property and discuss its application in Graphs?
6. What is the basic idea behind the backtracking technique for Hamilton circuit?
7. What is the purpose of using decision trees in analysing algorithm power?

SECTION - B

Answer any **SIX** questions. Each question carries **FIVE** marks.

(6X5=30)

8. Explain about Asymptotic notation with neat diagrams.
9. Given an array of integers, demonstrate step-by-step how Insertion Sort and Selection Sort would sort the array: **[29, 10, 14, 37, 13]**. Compare the number of key comparisons in each case.
10. What is Divide and Conquer method, explain merge sort for sorting the following show the steps and give the time complexity **15, 35, 9, 3, 12, 7, 14, 1, 8, 22.**
11. Explain the Greedy design strategy with suitable examples.
12. Explain dynamic programming, compute the binomial coefficient for 3rd term for $(X+Y)^6$. Show the tabular approach. Give the complete expansion of the binomial.
13. Differentiate DFS and BFS for the following graph (show Steps)



14. Design an algorithm using backtracking to solve the 4-Queen problem and illustrate the steps with a diagram.
15. What are NP-complete problems? Why are they important in understanding the limitations of algorithmic power?

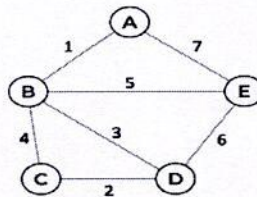


SECTION - C

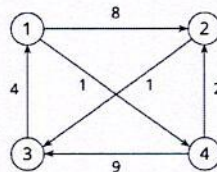
Answer any **FIVE** questions. Each question carries **EIGHT** marks.

(5X8=40)

16. Write an Algorithm for bubble sort and derive its Time complexity using mathematical analysis.
17. Write an algorithm to perform linear search on the following numbers **33, 21, 78, 8, 92, 11, 35, 5, 45, 52**. Discuss the Time complexity in detail for search **key = 33**, **key = 92** and **key is 50**.
18. Analyse the working of Kruskal's algorithm for finding the Minimum Spanning Tree. Illustrate for the following.



19. Analyse how Floyd-Warshall's algorithm updates shortest paths in each iteration for the given graph. (All source shortest path)



20. Consider five objects whose weights **[w1, w2, w3, w4, w5]** are **[1,2,5,6,7]** respectively and their values **[v1, v2, v3, v4, v5]** are **[1,6,8,22,28]** maximum capacity is **11**. Compute maximum profit for Knapsack 1/0 using Dynamic programming.
21. Given a directed acyclic graph (DAG) with 6 vertices and the following edges: **(1→2), (1→3), (2→4), (3→4), (4→5), (5→6)**. Perform topological sorting the in-degree method. Show the step-by-step process and write one valid topological order of the vertices.
22. Explain how the Backtracking is applied in Sum of the subsets problem. Discuss with example.

