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Reg. No.

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II Semester M.C.A. Degree Examination, December - 2023

COMPUTER SCIENCE

The Design and Analysis of Algorithm

(CBCS Scheme Y2 K20)

Paper : 2MCA5

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates

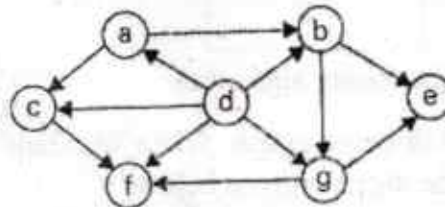
Answer any Five questions from Part - A and any Four questions from Part - B.

PART - A

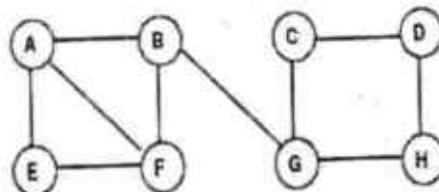
Answer any FIVE questions . Each question carries 6 marks.

(5×6=30)

1. Define algorithm. What are the criteria that an algorithm must satisfy?
2. Design an algorithm for performing sequential search and compute the best case, worst case and average case efficiency.
3. Apply quick sort algorithm to sort the list 4,1,3,2,7,6,5,8 in ascending order. Justify that the given instance is an example for best case.
4. Define topological sorting. Apply Source Removal method to obtain Topological sort for the given graph:



5. Traverse the following graph using Depth-First Search method. Write the order of traversal



[P.T.O.]



6. Present dynamic programming-based algorithm for computing binomial coefficient and analyse efficiency. Find 5C_3 .
7. Explain how space and time trade off can be achieved by input enhancement in Horspool string matching algorithm. Demonstrate using a suitable example.
8. Explain P, NP and NP-Complete problems.

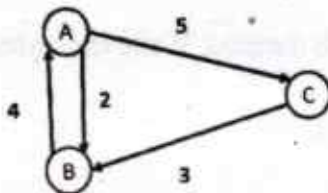
PART-B

Answer any Four questions. Each question carries 10 marks. (4×10=40)

9. a) Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm. (5+5)
b) Explain the general plan for analysing the efficiency of a recursive algorithm. Write the algorithm to find a factorial of a given number. Derive its efficiency.
10. a) Apply bottom-up dynamic programming algorithm to the following instance of knapsack problem of capacity W=5kgs. (6)

Item No.	Weight (kg)	Profit(Rs)
1	1	5
2	3	9
3	2	4
4	2	8

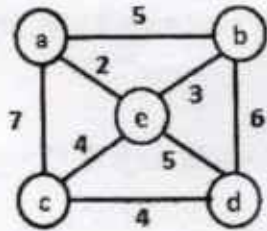
- b) Write brute force string matching algorithm. (4)
11. Define transitive closure of a directed graph. Write Warshall's algorithm and apply it to find the transitive closure of the digraph given below. (10)



12. a) Write the difference between backtracking and branch and bound. Solve 4 Queens problem. Construct a state space tree. (5+5)



- b) With the help of a state space tree find a subset of a given set $S = \{3,5,6,7\}$ of n positive integers whose sum is equal to a given positive integer $d=15$ using back tracking method.
13. a) Define minimum cost spanning tree. Write Prim's algorithm to find minimum cost spanning tree. (5+5)
- b) Apply Kruskal's algorithm to find the minimal cost spanning tree for the graph given.



14. a) Explain Huffman code and construct a Huffman tree for the following data using greedy technique. (5+5)

Symbol	A	B	C	D	-
frequency	0.4	0.1	0.2	0.15	0.15

- b) Using Dijkstra's method find the single source shortest-paths of the following graph applying greedy technique.

