BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – M.Tech.(CSE)-AIML-2022/M.Tech.(CSE)-AIML-2023
Course Name – Advanced Algorithm
Course Code - PCC-MCSM101
(Semester I)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify which of the following problems is not solved using dynamic programming?

a) 0/1 knapsack problem
b) Matrix chain multiplication problem
c) Longest common subsequence
d) Fractional knapsack problem

(ii) Identify the correct option, in the context of approximation algorithms, what does \"inapproximability\" refer to?

a) The ability to solve problems optimally
b) The number of approximation techniques available
c) The difficulty of approximating certain problems to within a certain factor
d) The efficiency of algorithms in general

(iii) Define Branch and bound is a _____

a) problem solving technique
b) data structure
c) sorting algorithm
d) type of tree

(iv) Select the correct option, Bellman-Ford algorithm can handle graphs with negative edge weights by using

a) Negates all edge weights
b) Uses dynamic programming and relaxation
c) Uses a priority queue
d) None of the above

(v) Identify which algorithm is more efficient for finding the single-source shortest path in a sparse graph?

a) Dijkstra\'s Algorithm
b) Bellman-Ford Algorithm
c) Both A and B are equally efficient
d) It depends on the specific graph

(vi) Choose the correct option, shortest path algorithms are used in various applications, including:

a) Network routing
b) GPS navigation
c) Social network analysis
d) All of the above

(vii) Select which shortest path algorithm can be used for solving the traveling salesman problem.

a) Dijkstra\'s Algorithm
b) Bellman-Ford Algorithm
c) Floyd-Warshall Algorithm
d) None of the above

(viii) Select the primary objective of the Ford-Fulkerson method.

a) Minimize the flow in the network
b) Compute the maximum flow in the network
c) Find the shortest path in the network
d) Optimize the capacity of the edges

(ix) Identify the correct option, if a graph has n vertices and every vertex has a degree of at least (n/2), then:

a) It is guaranteed to have a Hamiltonian cycle
b) It is guaranteed to be bipartite
c) It is not possible to determine Hamiltonicity from this information
d) It is guaranteed to be a tree

(x) Select what is the knapsack cover problem in combinatorial optimization?

a) Finding the maximum value of items to include in a knapsack
b) Determining the minimum weight of items to include in a knapsack
c) Finding the minimum number of items to cover a set of weights
d) Maximizing the number of items to fit in a knapsack

(xi) Select the algorithm which is NOT a typical application of randomized algorithms?

a) Sorting a list of integers.
b) Finding the minimum spanning tree of a graph.
c) Approximating the value of mathematical constants.
d) Solving linear equations

(xii) Select which of the following is the primary drawback of randomized algorithms?

a) They are difficult to analyze and predict.
b) They always have a high time complexity.
c) They require a large amount of memory.
d) They cannot be implemented in practice.

(xiii) Identify the correct option, which factor is commonly used to measure the quality of an approximation a Running time

a) Running time
b) Memory consumption
c) Approximation ratio
d) Compiler version

(xiv) Select the algorithm which is commonly used to solve the Graph Coloring Problem optimally.

a) Dijkstra\'s algorithm
b) Kruskal\'s algorithm
c) Greedy coloring algorithm
d) Backtracking algorithm

(xv) Choose the primary goal of Graph Coloring Problem.

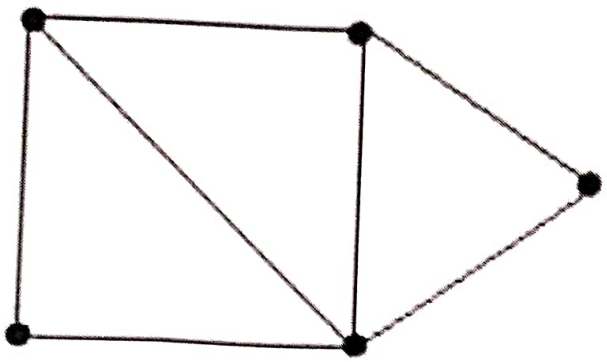
a) Maximize the number of colors used
b) Minimize the number of colors used
c) Assign colors randomly
d) Only use primary colors

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe the Approximate algorithm for vertex cover. (3)
3. Estimate the knapsack problem to maximize the profit: Weights: {3, 4, 6, 5} Profits: {2, 3, 1, 4} The weight of the knapsack is 8 kg. (3)

4. (3)



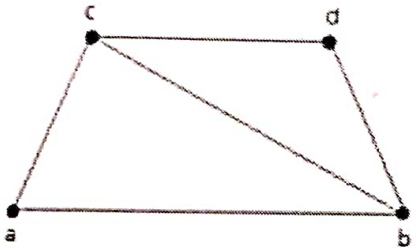
G

Evaluate maximum matching from this graph.

5. Explain residual capacity with example in maximum flow problem. (3)
6. Evaluate the following knapsack problem so that profit is maximized. weights and profits are: Weights: {3, 4, 6, 5} Profits: {2, 3, 1, 4} The weight of the knapsack is 8 kg (3)

OR

(3)



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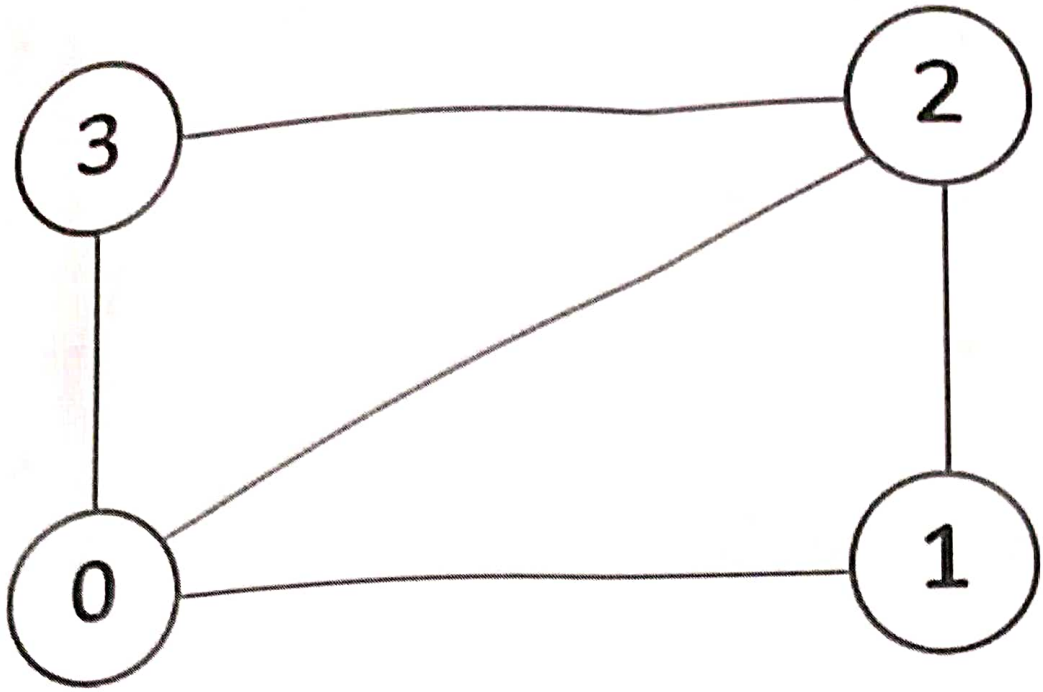
Evaluate mximum matching from the graph.

Group-C

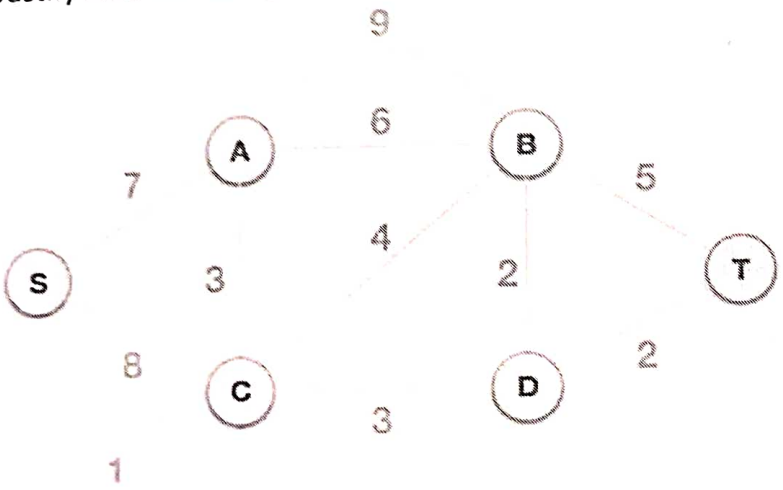
(Long Answer Type Questions) 5 x 6=30

7. (5)



Evaluate ho many colors are to be used to color this graph using backtracking method

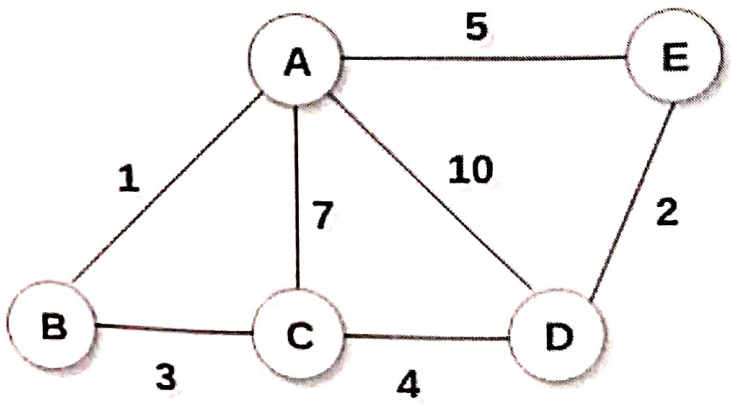
8. Explain the procedure for matrix multiplication to evaluate the product of n matrices. (5)
9. The matrices have size 4 x 10, 10 x 3, 3 x 12, 12 x 20, 20 x 7. Evaluate M [i,j], $0 \leq i, j \leq 5$. (5)
10. Explain Dynamic Programming and why Dynamic programming is needed ? (5)
11. Justify that Travelling Salesman problem is NP-Complete (5)
12. (5)



Evaluate the minimum spanning tree using Krushkal's algorithm.

OR

(5)



Evaluate the minimum spanning tree for the above graph using Krushkal's algorithm.

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