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Question Paper Code:R4203

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2025

Fourth Semester

Computer Science and Engineering

R21UCS403– ALGORITHM ANALYSIS

(Common to IT, AIDS, CSE (AIML), CSD, CSE(IOT), CSE(SC) Engineering branches)

(Regulations R2021)

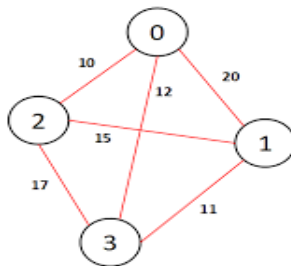
Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Differentiate between Best, average and worst case efficiency with example CO1- U
2. Evaluate the recurrence relation $x(n) = x(n-1) + 5$ for $n > 1$, $x(1) = 0$ CO1-App
3. Differentiate the methods involved in Brute force approach and Divide & Conquer approach CO1- U
4. Sort the given elements using Merge Sort Algorithm CO2-App
14,33,26,11,8
5. Summarize the need for Floyd Warshall algorithm. CO1- U
6. Find an optimal Huffman Code for the following set of frequencies: CO2-App
a: 20 b: 40 c: 60 d:80
7. Name the constraints used in backtracking problem with an example. CO1- U
8. CO1- U



Find the minimum distance using Travelling Salesman Problem.

9. How does the concept of Big-O notation relate to polynomial-time algorithms? CO2-App
10. Write the difference between NP Hard and NP Complete problems. CO1- U

PART – B (5 x 16= 80 Marks)

11. (a) Given two $n \times n$ matrices A and B, Analyze the time efficiency of the definition-based algorithm for computing their product $C = AB$. By definition, C is $n \times n$ matrix whose elements are computed as the scalar (dot) products of the rows of matrix A and the columns of matrix B. CO3- Ana (16)

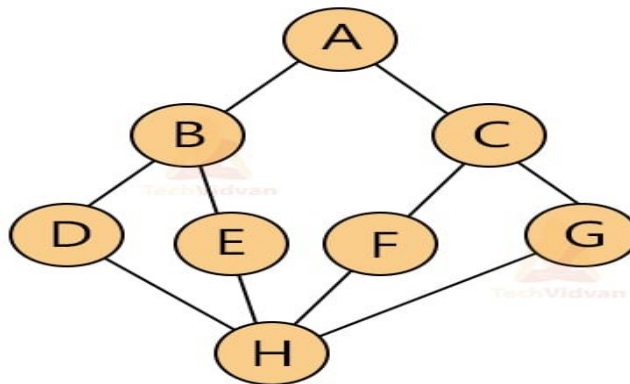
Or

- (b) Construct a recursive algorithm to count the number of digits in a binary representation of an integer. Setup and solve a recurrence relation for the number of times the algorithm's basic operation is executed. How does this algorithm works compare with the non-recursive algorithm for computing the number of digits in an integer? CO3- Ana (16)

12. (a) 40,55,63,17,22,68,89,97,72 Sort the elements using Merge Sort and also analyze the efficiency of this algorithm CO2- App (16)

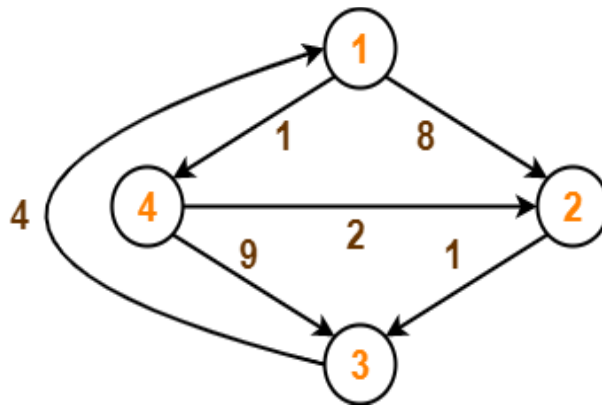
Or

- (b) Apply the BFS based algorithm to find whether the graph is cyclic or not and calculate the complexities for this algorithm CO2- App (16)



13. (a)

CO2- App (16)

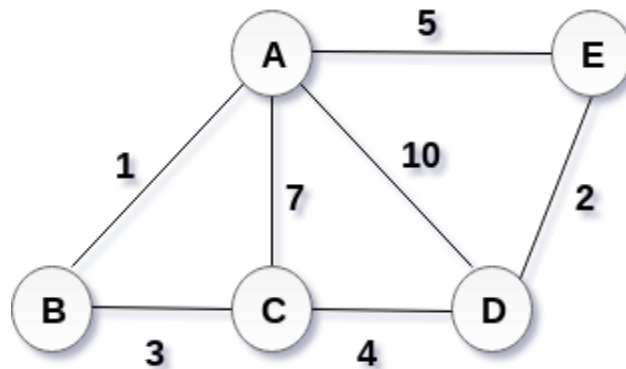


Apply the Floyd algorithm for the given graph to find the shortest paths between all pairs of vertices in a directed weighted graph

Or

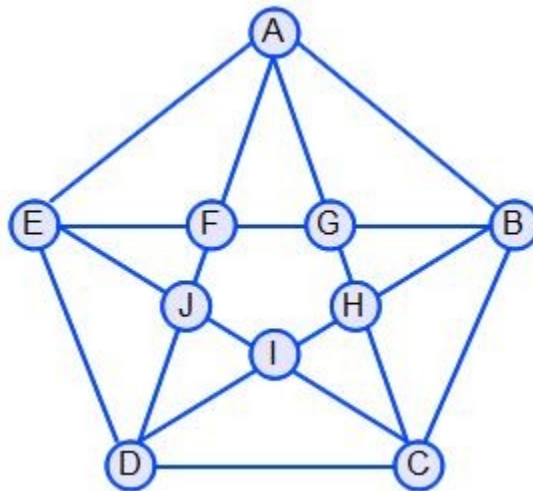
- (b) Find out the minimum spanning tree using Kruskals algorithm and analyze the algorithm

CO2- App (16)



14. (a) Find the Hamiltonian Path for the above mentioned graph

CO2- App (16)



Or

- (b) Solve the sum of subset problems using backtracking algorithmic strategy for the following data: $n = 4$ $W = (w_1, w_2, w_3, w_4) = (11, 13, 24, \text{ and } 7)$ and $M = 31$.

CO2- App (16)

15. (a) Whether Hamiltonian Circuit problem is an NP hard Problem? CO2- App (16)
Justify your answer with proper explanation
Or
- (b) Take the problem of optimizing delivery routes for a fleet of trucks CO2- App (16)
(like the Traveling Salesman Problem). Discuss how this problem fits into the complexity classes of P, NP, NP-hard, and NP-complete. Justify your answer using a Venn diagram representation.