POSSESION OF MOBILES IN EXAMS IS UFM PRACTICE.

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Jaypee Institute of Information Technology, Noida

T2 Examination, Even 2023

B. Tech. IV Semester

Course Name: Algorithms and Problem Solving — Maximum Time: 1 Hr.

Course Code: 15B11CI411 — Maximum Marks: 20 Marks

CO1	Analyse the complexity of different algorithms using asymptotic analysis.
CO2	Select appropriate sorting and searching technique for problem solving
CO3	Apply various algorithm design principles for solving a given problem
CO4	Identify, formulate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique.

Q1. **[CO3] [5 Marks]** It is desired to perform the multiplication of matrices as per the following sequence:

$$A_1 \times A_2 \times A_3 \times A_4 \times A_5$$

Considering the order/dimensions of the matrices, $A_1 \times A_2 \times A_3 \times A_4 \times A_5$ as (7×5), (5×3), (3×1), (1×4), (4×2), find out the minimum number of multiplication operations needed to multiply these matrices in given sequence.

Q2. **[CO3]** It is desired to compress a message, M using Huffman Encoding. Following table presents the frequency of the characters present in the message, M (having 83 characters)

Character	Frequency
A	10
B	25
C	17
D	8
E	11
F	9
G	3

Answer following:

(a) **[3 Marks]** Apply Huffman Encoding to encode the unique characters A to G of the message M (having 83 characters). Further, compute the count of bits in the compressed message when the message M (having 83 characters) was encoded using Huffman Encoding.

(b) **[3 Marks]** Let us consider a small segment (say S) of the message M as: AABACEDG. Encode this segment using the encoding scheme of each unique character obtained using Huffman Encoding in Part A. Further, decode this encoded/compressed message segment, S?

Q3. **[CO4]** Finding the edge disjoint paths between any two vertices (say V1 and V2) in a directed graph (say GR) is the problem where we need to find out all the paths from V1 to V2 so that edge in GR appears in at most once in all the identified paths between V1 and V2. As an example, in following graph (GR), the two paths BDEG and BDCG between two vertices, B and G cannot be called as edge disjoint because both paths contain a common edge BD.

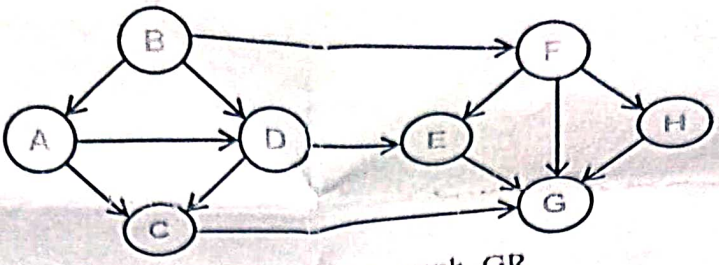

Fig. 1: Given graph, GR

(a) **[3 Marks]** Propose an efficient scheme (mentioning the algorithmic steps) to **find out the count of all the edge-disjoint paths** between any two vertices in a directed graph.

(b) **[2 Marks]** Apply your scheme (elaborating all the intermediate steps) to find out **the count of all the edge-disjoint paths** between vertex B and G in the graph, GR given in Fig. 1.

Q4. **[CO3] [4 Marks]** It is desired to find out the minimum spanning tree (MST) for the weighted graph, GR given in Fig. 2. Out of the two approaches to find MST, *i.e.* Prim's and Kruskal's, which one you will use to find out the MST for the given graph, GR? Justify your selection.

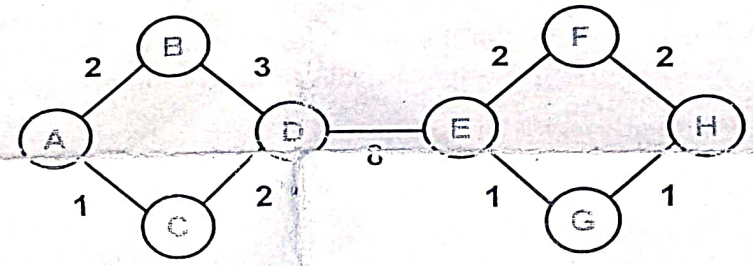

Fig. 2: Given weighted graph, GR