

**2021**

**COMPUTER SCIENCE — HONOURS**

**Paper : CC-9**

**(Introduction to Algorithms and Its Application)**

**Full Marks : 50**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

Answer **question no. 1** and **any four** from the rest.

1. Answer **any five** questions : 2×5
- (a) Mention the time complexity of BFS traversal of a graph.
  - (b) Define  $\Omega$ . Show that  $10n^2 + 6n + 3$  is  $\Omega(n^2)$ .
  - (c) What do you understand by worst case time complexity of an algorithm? Give an example.
  - (d) Define P and NP class of problems.
  - (e) Differentiate recursive and non-recursive algorithm.
  - (f) Briefly state an experiment where divide-and-conquer rule approach is suitable.
  - (g) Mention one advantage and one disadvantage of Greedy algorithm.
  - (h) Define minimum spanning tree.
2. (a) Mention the purpose of Floyd-Warshall algorithm.
- (b) Write down Floyd-Warshall algorithm. 2+8
3. (a) Briefly discuss about Travelling Salesman Problem.
- (b) Solve the following Travelling Salesman Problem (TSP) using dynamic approach.
- There are four cities 1, 2, 3 and 4. Start from city 1 visit all cities.
- The cost matrix is given below : 3+7

$$\begin{array}{c} 1 \quad 2 \quad 3 \quad 4 \\ 1 \left[ \begin{array}{cccc} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{array} \right] \end{array}$$

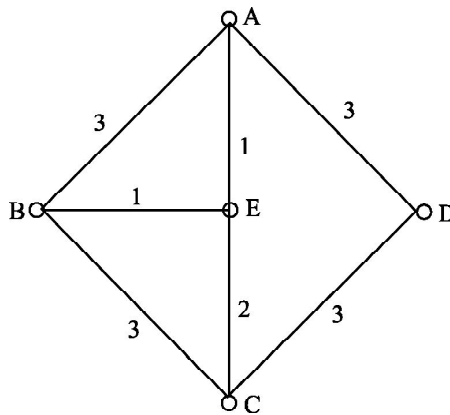
**Please Turn Over**

4. (a) Differentiate between divide-and-conquer methods and Dynamic programming approach.  
 (b) Apply dynamic programming approach to find the following matrix chain multiplication.

$A_1 A_2 A_3 A_4 A_5 A_6$

<u>Matrix</u>	<u>Dimension</u>	
$A_1$	$30 \times 35$	
$A_2$	$35 \times 15$	
$A_3$	$15 \times 5$	
$A_4$	$5 \times 10$	
$A_5$	$10 \times 20$	
$A_6$	$20 \times 25$	3+7

5. (a) Briefly state the graph colouring problem.  
 (b) Write down the BFS algorithm. 4+6
6. (a) Write down Kruskal's algorithm.  
 (b) Find the Kruskal's algorithm, a minimal spanning tree of the weighted graph.



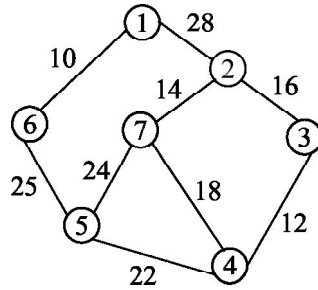
5+5

7. (a) Explain briefly the strategy used in divide-and-conquer (D & C) method.  
 (b) Write the algorithm of D & C method for a problem P. State the recurrence relation for computing time of D & C method. 4+4+2

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8. (a) State the Knapsack problem formally. What is its time complexity using Greedy algorithm?  
(b) Apply Prim's algorithm to find the minimum spanning tree of the graph given below.



(3+2)+5

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