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 Ω. 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

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

4. (a) Differentiate between divide-and-conquer methods and Dynamic programming approach.

(b) Apply dynamic programming approach to find the following matrix chain multiplication.

$A_1\ A_2\ A_3\ A_4\ A_5\ A_6$

Matrix	Dimension
A_1	30×35
A_2	35×15
A_3	15×5
A_4	5×10
A_5	10×20
A_6	20×25

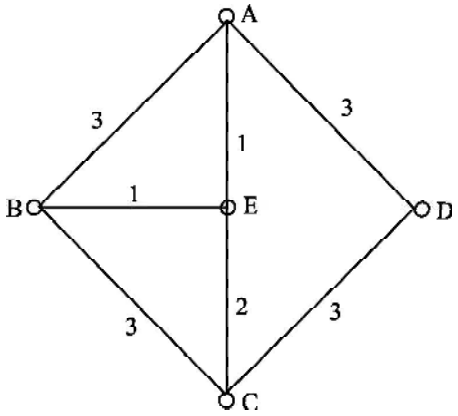
3+7

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.



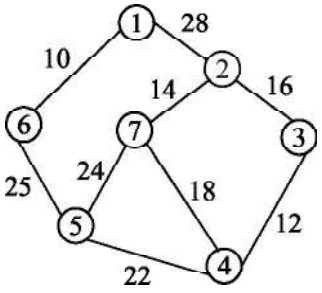
5+5

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

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