



- Notes :
1. All question carry equal marks.
  2. Answer **three** question from Section A and **three** question from Section B.
  3. Due credit will be given to neatness and adequate dimensions.
  4. Assume suitable data wherever necessary.
  5. Diagrams and chemicals equations should be given wherever necessary.
  6. Use of pen Blue/Black ink/refill only for writing the answer book.

**SECTION - A**

1. a) Explain Asymptotic Notations? Explain Big oh Notations? 6  
b) Prove by Contradiction, 'There are infinitely many prime numbers'. Illustrate the proof by an Algorithm ? 7

**OR**

2. a) Explain : 6  
i) Maximum Rule ii) Duality Rule  
iii) Threshold Rule  
b) What is Elementary Operation ? Explain with suitable example ? 7
3. a) Explain Analysis of Algorithm by the technique using barometer ? 6  
b) Give the Recurrence 7  
$$T(n) = 3T\left(\frac{n}{2}\right) + n,$$

Use the Intelligent Guesswork (IGW) method to get a Big O estimate for T(n) ?

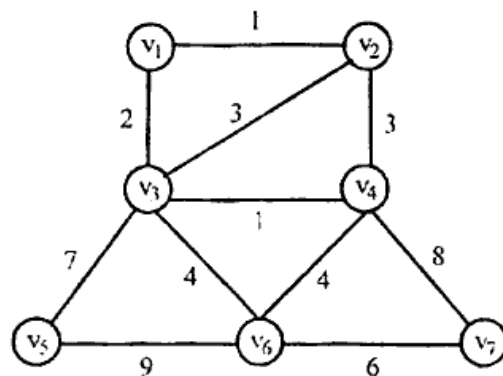
**OR**

4. a) Explain Amortised Analysis using potential functions ? 6  
b) Give the Recurrence 7  
$$t(m) = \begin{cases} 0 & \text{if } m = 0 \\ 2t(m-1) + 1 & \text{otherwise} \end{cases}$$

Use Inhomogeneous recurrence method to get a Big O estimate for t(m) ?
5. a) Explain Knapsack Algorithm with example ? 7  
 $n = 5, m = 100, w = (11, 22, 33, 44, 55)$  & having value  $v = (20, 33, 66, 44, 48)$ .  
b) Explain the method suggested by Volker Strassen's matrix multiplication. What is its time complexing ? 7

**OR**

6. Write the Kruskal's & Prim's Algorithm to generate minimum cost spanning tree, simulate both the Algorithms for the given graph ? 14



**SECTION - B**

7. Use Branch & Bound technique to solve the assignment problem with following cost matrix. 14

	1	2	3	4
1	94	1	54	68
2	74	10	88	82
3	62	88	8	76
4	11	74	81	21

**OR**

8. a) Explain Chain Matrix Multiplication Algorithm for dynamic programming. State how the algorithm works to calculate the product of four matrices. Where A is  $34 \times 8$ , B is  $8 \times 98$ , C is  $98 \times 5$ , D is  $5 \times 13$  ? 9

- b) Explain Minimax principle ? 5

9. a) Explain Buffon's Needle theorem ? 6

- b) Explain Monte Carlo Algorithm in brief ? 7

**OR**

10. a) Explain 'Computing with Binary Tree' Technique in brief ? 6

- b) What is probabilistic Algorithm ? How it is different from deterministic Algorithm ? Explain with example ? 7

11. a) Explain the following : 6
- Heuristic Algorithm
  - Hamiltonian path
  - Chromatic number of graph

- b) Prove that any Binary tree with K leaves has an average height of at least  $\log_2 k$ . 7

**OR**

12. a) Prove that  $P \subseteq NP$  ? 6

- b) Prove that  $HAM \equiv^P_{T} HAMD$  ? 7

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