



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Define algorithm. Explain the characteristics of algorithm. 6
- b) Solve the following equation 7

$$t_n = \begin{cases} n & \text{if } n = 0 \text{ or } n = 2 \\ 5t_{n-1} - 8t_{n-2} + 4t_{n-3} & \text{otherwise} \end{cases}$$

OR

2. a) Solve the following using master's method. 9
- i) $T(n) = 2T(n/4) + n$
 - ii) $T(n) = 3T(8n/4) + n^2$
 - iii) $T(n) = 6T(n/8) + \log n$
- b) Write an algorithm for finding summation of array of size 'n' using recursive approach. 4
3. a) Write recursive algorithm for insertion sort using same algorithm sort the following array A. 7
- $A = [18, 12, 44, 64, 76, 15, 129, 20, 98]$
- b) What is bitonic sorting network? Clean the following sequence using half cleaner 6
- $\langle 01001100 \rangle$

OR

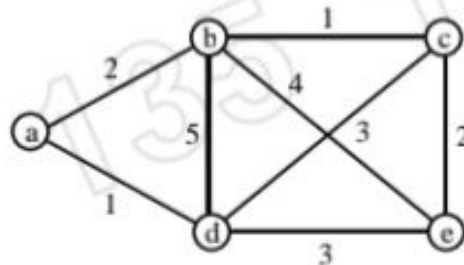
4. a) Explain the disjoint set representation data structure with respect to following operation. 7
- i) Create set
 - ii) Merge / Union set
 - iii) Find - set
- Perform the following sequence of operation.
- | | |
|--|-----------------|
| 1) Consider set = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} | 2) Union (2, 1) |
| 3) Union (4, 3) | 4) Union (8, 4) |
| 5) Union (9, 3) | 6) Union (6, 5) |
| 7) Find (8, 9) | 8) Find (0, 7) |

- b) Represent the function using best case, worst case and average case asymptotic notation. 6

$$F(n) = 10n^2 + 4n + 2$$

5. a) Explain divide and conquer strategy. Discuss the worst case complexity of any binary search algorithm based on this strategy. 6

- b) Write KURSHKAL's algorithm to generate the spanning tree. Apply the algorithm on following graph. 8



Write the complexity of the Algorithm.

OR

6. a) Calculate minimum & maximum element from following array using min – max Algorithm. $B = \{20, 19, 17, -15, 16, 20, 19\}$. 7

- b) Solve the following using partial knapsack. 7

$$P = \{10, 15, 20, 16, 9\}$$

$$W = \{2, 8, 6, 5, 3\} \text{ and } n = 5, M = 15.$$

7. a) Obtain the shortest path using TSP. 6

$$\begin{bmatrix} 0 & 4 & 8 & 3 \\ 2 & 0 & 7 & 9 \\ 4 & 11 & 0 & 8 \\ 8 & 4 & 6 & 0 \end{bmatrix}$$

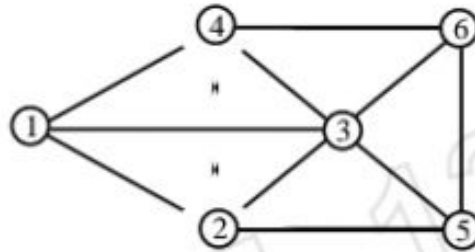
- b) Draw optimal Binary Search Tree for the following parameter. 7

I	P_i	q_i
0	--	0.05
1	0.15	0.10
2	0.10	0.05
3	0.05	0.05
4	0.10	0.15
5	0.20	0.10

OR

8. a) Write & explain Bell – man ford Algorithm. 6

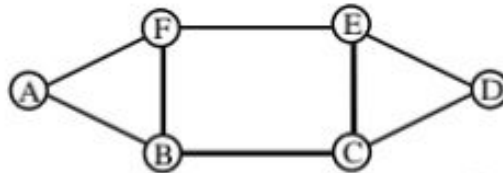
- b) What is back tracking? Explain implicit & Explicit constraints. Also obtain DFS tree for following graph. 7



9. a) Calculate the minimum number of scalar multiplication for following set of matrix using matrix chain multiplication. 7

$$A = 4 \times 5 \quad B = 5 \times 3 \quad C = 3 \times 2 \quad D = 2 \times 7$$

- b) What is planner graph? Implement graph coloring and generate solution space tree for following graph. 6



OR

10. a) Generate the space tree for following data using sum of subset problem. 6
 $S = \{10, 9, 15, 5, 1\}; M = 25$.

- b) Explain 8 queen problem. Give atleast two solutions for this problem. 7

11. a) Explain Class P, Class NP and Class NP complete with suitable example. 9

- b) Explain Cook's theorem. 5

OR

12. Explain the following **any four**. 14

- i) CLIQUE
- ii) Independent set problem.
- iii) Graph partitioned into triangle.
- iv) Polynomial reduction.
- v) Decision & Optimization problem.
