

Faculty of Science & Technology  
Fifth Semester B.Tech. (Computer Science and Engineering) (C.B.C.S.) Examination  
**DESIGN AND ANALYSIS AND ALGORITHMS**

Time Three Hours]

[Maximum Marks 70]

**INSTRUCTIONS TO CANDIDATES**

- (1) All questions carry marks as indicated.
  - (2) Solve Question No. 1 OR Question No. 2.
  - (3) Solve Question No. 3 OR Question No. 4.
  - (4) Solve Question No. 5 OR Question No. 6.
  - (5) Solve Question No. 7 OR Question No. 8.
  - (6) Solve Question No. 9 OR Question No. 10.
  - (7) Due credit will be given to neatness and adequate dimensions.
  - (8) Assume suitable data whenever necessary.
1. (a) Demonstrate the concept of algorithm with example and explain the characteristics of algorithm. 7
  - (b) Explain Asymptotic notations. Find upper bound, lower bound and tight bound range for following :
    - $21n^2 + 9n + 6$
    - $5n + 12$  7

**OR**

2. (a) Find time complexity for following algorithm  
 sum (a[], n)  
 {  
   S=0.0  
   for i 1 to n do  
     S=S + a[i]  
   return S  
 } 4
- (b) Solve the following Recurrence : 5

$$T(n) = 0 \quad \text{if } n = 0$$

$$T(n) = 5 \quad \text{if } n = 1$$

$$T(n) = 3T_{n-1} + 4T_{n-2} \quad \text{otherwise.}$$

(c) Solve the following recurrence using Master's theorem.

$$T(n) = T(n/4) + \sqrt{n} + 4 \text{ for } n > 4 \text{ and } T(1) = 4$$

5

3 (a) What do you mean by amortized analysis of algorithm? Explain any two methods with suitable example.

7

(b) Find the average number of successful and unsuccessful search. Also find internal and external path length. Consider the array given below to perform Binary search.

153 8, 0, 7, 10, 20, 40, 80, 92, 101, 110, 121, 138, 145, 160.

7

OR

4 (a) Explain job scheduling approaches. Find the best possible sequence for the following deadlines:

Jobs	Gains	Deadlines
1	35	3
2	20	1
3	18	3
4	16	4
5	12	2
6	10	2
7	8	1

7

(b) Use Strassen's algorithm to compute the matrix product. Show the process:

$$A = \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 6 & 4 \\ 3 & 2 \end{bmatrix}$$

7

5 (a) Find the minimum number of multiplications required to multiply the matrices of given dimension using chained matrix multiplication. Dimension of matrices are:

$$\bar{A} = 13 \times 5, B = 5 \times 89, C = 89 \times 3, D = 3 \times 34.$$

7

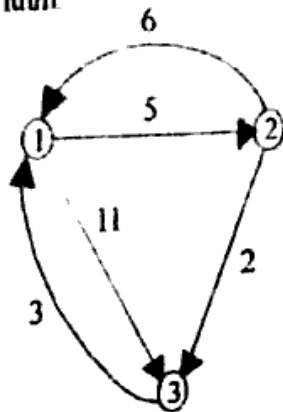
(b) Determine LCS:  $X = \{AGGTABZ\}$ ,  $Y = \{GXTXAYB\}$ .

Write the recurrence equation for LCS. Also state the length of longest common subsequence.

7

OR

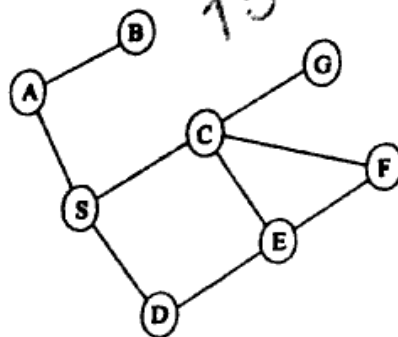
6. (a) Find out shortest distance between all pairs of vertices and write the Floyd Warshall all pair shortest path algorithm.



- (b) What is TSP ? Compute optimal TSP tour for the following distance matrix using dynamic programming approach. <https://www.rtmnuonline.com>

	A	B	C	D
A	0	10	15	20
B	5	0	9	10
C	6	13	0	12
D	8	8	9	0

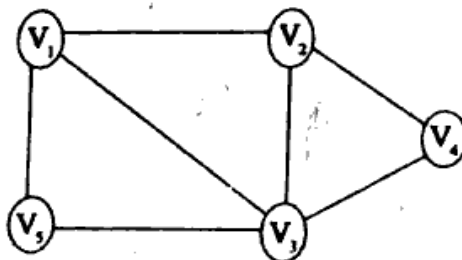
7. (a) Write the algorithm for Breadth First Search (BFS). Also perform BFS on the given graph, showing operations using stack. State the output sequence generated :



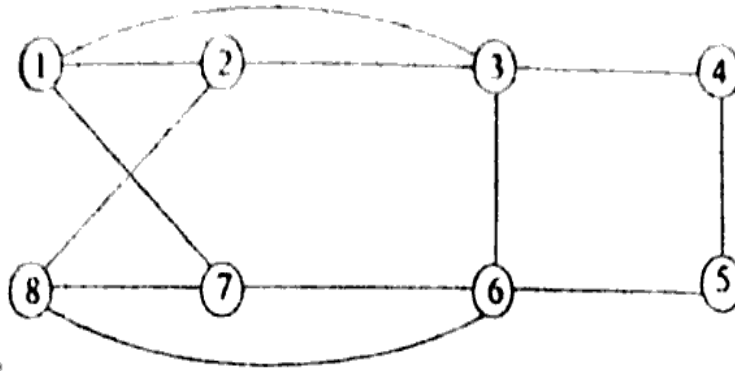
- (b) Explain 8 Queens problem. Explain the explicit & implicit constraints associated with this problem. Give at least two solutions for this problem. Write the algorithm.

OR

8. (a) Perform Graph Coloring on the given graph. State the total number of possible solutions :



(b) What is the use of Hamiltonian Cycle ? Implement Hamiltonian cycle on following graph



9 (a) Write notes on :

- (i) Deterministic Algorithm.
- (ii) P class problem.
- (iii) NP – Hard.
- (iv) NP – complete.

(b) Write non – deterministic algorithm to generate CLIQUE of size k from graph of n vertices.

OR

10 (a) Explain following NP – problems with respect to graph :

- (i) CLIQUE
- (ii) Independent set problem
- (iii) Graph partitioned into triangle.

(b) What are decision and optimization problems ? Explain in detail.

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