Course Code : CCT 206 **MQNR/RS – 23 / 1165**

Fourth Semester B. Tech. (Computer Science and Engineering / Cyber Security) Examination

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Due credit will be given to neatness and adequate dimensions.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Solve the recurrence relations using master method :

(i) $T(n) = 4T(n/4) + 2n \quad n > 1$

(ii) $T(n) = 4T(n/4) + n\log n \quad n > 1$ 5(CO1)

(b) Solve the recurrence relation using substitution method :

$T(n) = 2T(n/3) + cn \quad n > 1$

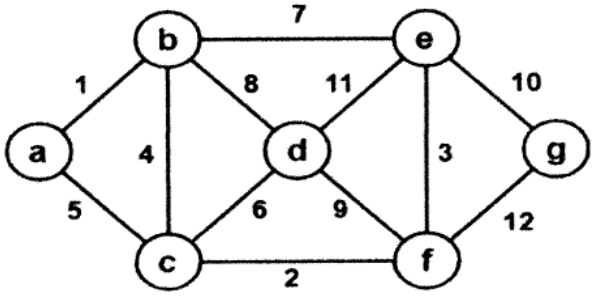
$= 1 \quad n = 1$ 5(CO1)

2. (a) Find the maximum sum sub array for the given data set using Divide and Conquer method. Represent the result of intermediate states for Left Sub array, Right Sub array and Crossing Sub array with the help of algorithm. Also comment on complexity.
Data set = [2, –1, 3, –4, 1, –2, –1, 5, –4]. 5(CO2)

(b) Discuss the drawback of divide-conquer approach for matrix multiplication. Multiply the given matrices A and B using Stassen's matrix multiplication algorithm.

$$A = \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} \quad B = \begin{pmatrix} 8 & 4 \\ 6 & 2 \end{pmatrix}$$ 5(CO2)

3. (a) Given a set of 7 vertices weighted graph where all its edge weights w(u, v) are non-negative, find the Minimum Cost Spanning Tree (MCST) along with the cost for the given graph G using Kruskal's Algorithm. Show the results of intermediate steps. Also write the algorithm and comment on complexity.



5(CO2)

(b) Demonstrate the significance of Knapsack problem using all three methods as maximum profit, maximum weight and profit / weight ratio. Capacity = 20, n = 7. Also comment on complexity and the method giving maximum profit.

Profit	10	15	25	20	5	8	30
Weight	2	3	5	7	1	4	1
Index	1	2	3	4	5	6	7

5(CO2)

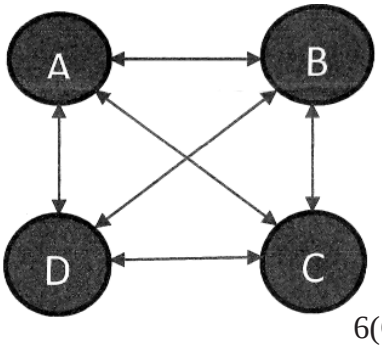
4. (a) Identify the similar component of longest size between two given strings. For the LCS, explain the formulation of constraint equation complexity and application of this problem.

String 1 : EXPANDING

String 2 : SPREADING 4(CO3)

(b) Given a list of 4 cities and the distances between each pair of cities, Name the suitable strategy and compute the shortest possible route that visits each city exactly once and returns to the origin city. Consider the distance between cities shown in adjacency matrix. Also comment on complexity.

Vertex	A	B	C	D
A	0	15	20	25
B	10	0	14	15
C	11	18	0	17
D	13	13	14	0



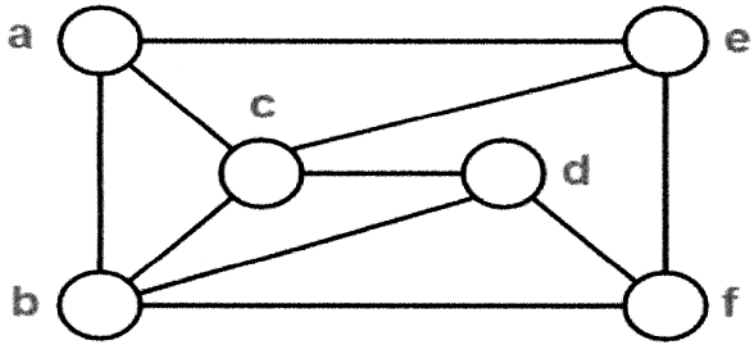
6(CO3)

5. (a) A graph G = (V, E) with 6 vertices and 10 edges shown below. Provide the answer for following questions :

(i) Explain the constraints used in backtracking solutions for Hamiltonian Cycle problem.

(ii) Comment on complexity.

(iii) Does the below graph contains a Hamiltonian cycle ? If yes write the cycle and make a state space tree with explanation.



5(CO3)

(b) Explain two types of constraints in backtracking solutions. For the process of N – Queen problem, explain the formulation of constrain equation and its usage in finding the suitable position of Queens. Draw state space tree for 4 – Queen problem. 5(CO3)

6. (a) Explain the following terms :
P, NP, NP-Complete and NP-Hard.
Also show the difference between approximation and decision algorithm by considering vertex cover problem. 6(CO4)

(b) Explain the three functions for implementing non-deterministic algorithm with suitable example. 5(CO4)