Course Code : CCT 206 **KQLR/RS – 24 / 1060**

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) Make proper assumptions wherever necessary and illustrate answers with examples wherever necessary.

(2) All questions carry marks as indicated against them.

1. (a) Solve the following logarithmic recurrence :

$T(n) = T(n/2) + \log_2 n$ where $T(1) = 3$ 5(CO1)

(b) Solve the following recurrence using substitution method and generate suitable upper bound :

$T(n) = 2T(n/2) + cn^3$ $n \geq 2$, $T(1) = 1$ 5(CO1)

2. (a) Apply MergeSort algorithm to sort on the following in increasing order. Show stepwise execution for Merge function :

{139, 76, 85, 147, 101, 93, 82, 75, 26, 34} 5(CO2)

(b) Illustrate the closest-pair-of-point algorithm using divide and conquer approach to find a closest pair for the given set of points :

(7, 4), (3, 10), (11, 10), (5, 4), (1, 2), (17, 10), (8, 7), (8, 9), (11, 13), (1, 5), (11, 7), (5, 9), (3, 7), (14, 7). 5(CO2)

3. (a) Demonstrate the significance of Knapsack problem using greedy methods. Write the algorithm and complexity equation. Capacity = 18, n = 7.

Index	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Profit	12	6	15	7	6	17	3
Weight	2	4	5	7	3	4	1

5(CO2)

(b) An internet streaming service seeks to maximize the way that audio files are sent to customers with constrained bandwidth. By reducing the size of audio files, Huffman coding allows users with limited bandwidth to stream content more quickly and have fewer buffering problems.

Illustrate Huffman coding for following data :

"ABABBDDABBCCEEDFFEEFFF"

(a) Total size of the message in fixed length encoding.

(b) Total size of the message in Huffman encoding.

(c) Huffman code for each character. 5(CO2)

4. (a) Construct an optimal binary search tree for the following set of probabilities and find out the cost :

i	0	1	2	3	4
$\mathbf{p_i}$		0·1	0·1	0·2	0·3
$\mathbf{q_i}$	0·05	0·05	0	0·05	0·15

5(CO3)

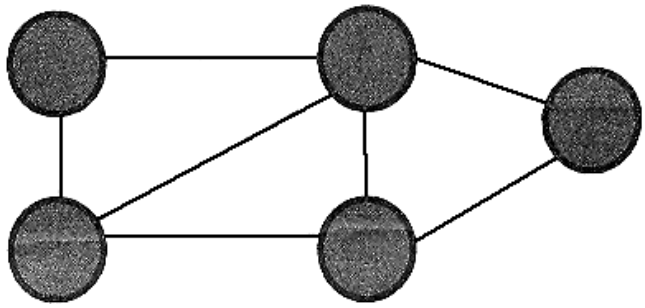
(b) Write an algorithm to print the longest matching subsequence. Implement the algorithm on following strings :

String 1 : POTENTIAL

String 2 : EXPONENTIAL

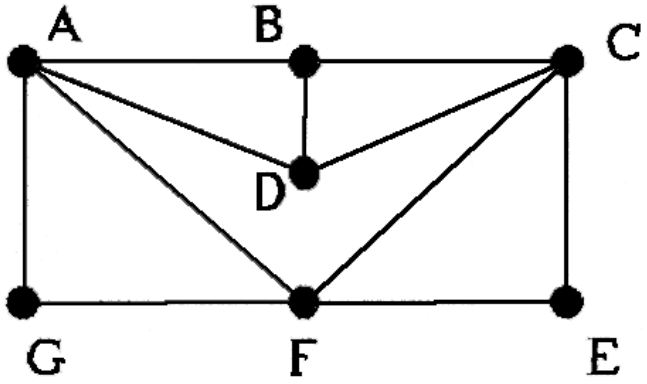
Comment on space complexity. 5(CO3)

5. (a) Propose a backtracking formulation for graph coloring problem. Find out the Chromatic number for coloring the graph.



5(CO3)

(b) Write an algorithm for Hamiltonian cycle problem. Apply the algorithm on following graph and design cycle. Comment on complexity of algorithm.



5(CO3)

6. (a) List any TWO characteristics of Approximation Algorithm. Write an algorithm for Vertex Cover Problem. 5(CO4)

(b) Define independent set problem. Prove that it is an NP complete problem with the help of satisfiability problem. 5(CO4)