Nirma University

Institute of Technology

Semester End Examination (IR), May-2019

B.Tech. in Computer Engineering/Information Technology, Semester -VI

CE601 – Design and Analysis of Algorithms

Roll / Exam No. | Supervisor's Initial with Date

Time: 3 Hours | Max Marks: 100

Instructions:
1. Attempt all the questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever required.

Q-1 Do as directed **[16]**

A CO-1 BL-2 Solve the following recurrences (give asymptotic tight bound) [8]

1. $n\,T_{(n)} = 2n\,T_{(n/2)} + \log n$

2. $t_n = \begin{cases} 1 & \text{if } n = 0 \\ 4t_{n-1} - 2^n & \text{otherwise} \end{cases}$

B CO-1 BL-2 State and prove Master's Theorem for analysing the asymptotic behaviour of divide-and-conquer algorithms. [8]

Q-2 Do as directed (any two) **[18]**

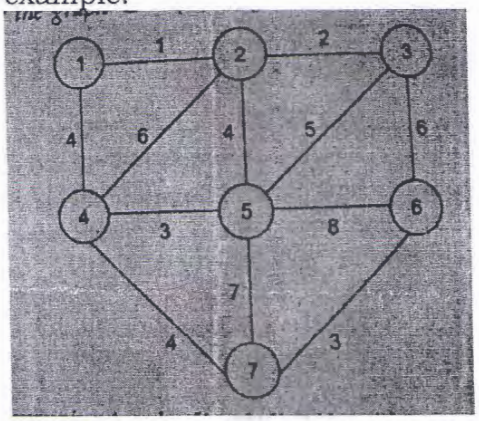
A CO-2 BL-3 Prove that Travelling Salesman Decision Problem is NP Complete. [9]

B CO-2 BL-3 Differentiate with suitable examples: [9]
1.NP Hard and NP Complete
2.P and NP Problems

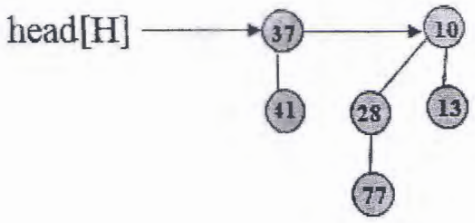
C CO-2 BL-3 What is amortized analysis of an algorithm? Compare accounting method, potential method and aggregate analysis with suitable example. [9]

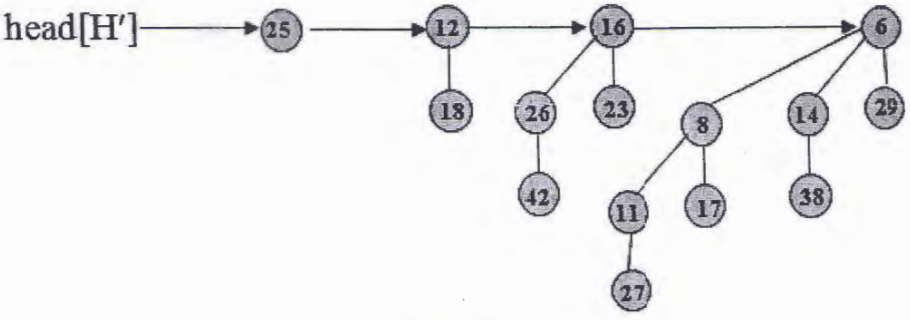
Q-3 Do as directed **[16]**

A CO-3 BL-4 Write Kruskal's algorithm to find MST in a graph. Use binomial heap to find edge with minimum weight and use disjoint set data structure to detect cycle and trace this algorithm on following example. [8]



B CO-3 BL-4 Given the two heaps H and H' find the union of these two heaps. What are the applications of union of two heaps? [8]





Section II

Q-4 Do as directed **[16]**

A CO-4 BL-3 Whether the Huffman code algorithm is greedy approach? Justify your opinion. Find the optimal Huffman code for the following set of frequencies based on first 8 Fibonacci numbers? [8]

A:1 B:1 C:2 D:3 E:5 F:8 G:13 H:21

B CO-3 BL-6 In an infinite array, the first n cells contains integers in sorted order and rest of the cells are filled with ∞. Device an algorithm that takes x as input and finds the position of x in the array in (logn) time. Value of n is not given. Give trace of your algorithm on suitable example. [8]

Q-5 Do as directed **[18]**

A CO-4 BL-6 Device a Dynamic Programing Algorithm to find the length of longest subsequence of a given sequence (of integers) such that all elements of subsequence are sorted in strictly decreasing order. Give trace of your algorithm on following sequence: [9]

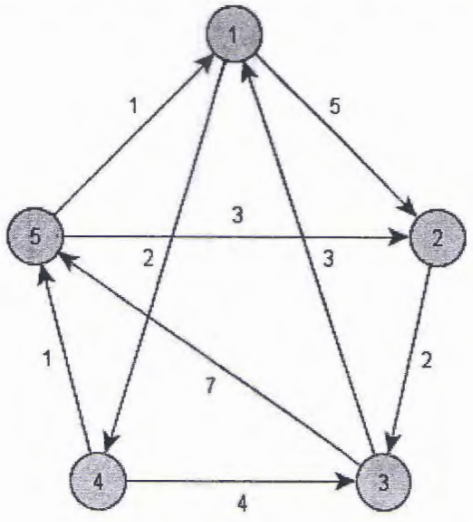
Sequence: 5, 13, 8, 10, 14, 6, 12

OR

A CO-4 BL-6 Device Back tracking solution for finding Hamiltonian cycle for given graph. Trace it for the following adjacency matrix of a graph. [9]

	A	B	C	D	E
A	1	0	1	0	0
B	0	1	1	0	1
C	1	1	0	1	0
D	0	1	1	0	0
E	1	0	0	1	0

B CO-4 BL-3 Discuss the applicability of Bellman Ford algorithm for different kinds of graphs and Find all pair shortest path for the following graph using Bellman Ford algorithm. [9]



Q-6 Do as directed (Any Two) **[16]**

A CO-4 BL-5 Differentiate beween FIFO Branch and Bound and Least Cost Branch and Bound strategy. Compare implementation aspects of both the strategies using a suitable example. Evaluate both the strategies with respect to convergence time. [8]

B CO-4 BL-5 Apply Hungerian algorithm to assign the four tasks to four operators. The assigning costs are given in Table. Evaluate Time complexity of the algorithm. [8]

		Operators			
		1	2	3	4
Tasks	A	20	28	19	13
	B	15	30	31	28
	C	40	21	20	17
	D	21	28	26	12

C CO-4 BL-5 The N Queen is the problem of placing N chess queens on an N×N chessboard so that no two queens attack each other, Design an algorithm for solving N-Queen Problem using backtracking and evaluate time complexity. [8]