

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 Solve the following recurrences (give asymptotic tight bound)

[8]

CO-1
BL-2

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 State and prove Master's Theorem for analysing the asymptotic behaviour of divide-and-conquer algorithms.

[8]

CO-1
BL-2

Q-2 Do as directed (any two)

[18]

A Prove that Travelling Salesman Decision Problem is NP Complete.

[9]

CO-2
BL-3

B Differentiate with suitable examples:

[9]

CO-2
BL-3

1. NP Hard and NP Complete
2. P and NP Problems

C What is amortized analysis of an algorithm? Compare accounting method, potential method and aggregate analysis with suitable example.

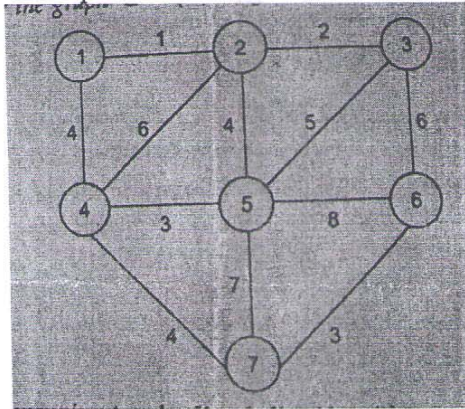
[9]

CO-2
BL-3

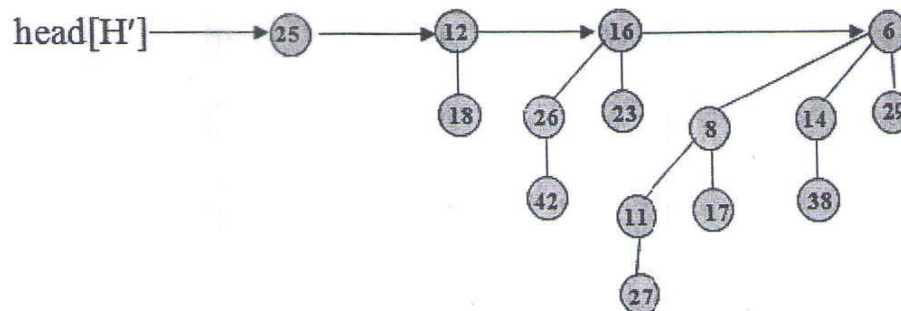
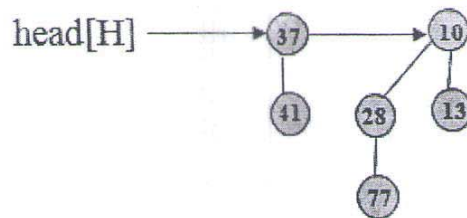
Q-3 Do as directed

[16]

A 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.



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



Section II

Q-4 Do as directed

[16]

A 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?

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

- B** 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 $(\log n)$ time. Value of n is not given. Give trace of your algorithm on suitable example. [8]
- CO-3
BL-6

Q-5 Do as directed

- A** Device a Dynamic Programming 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: [18]
- CO-4
BL-6

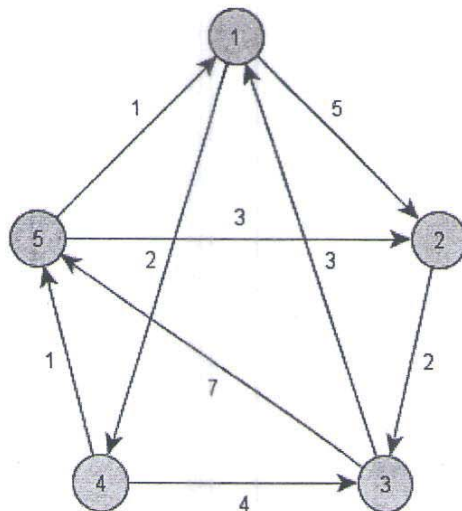
Sequence: 5, 13, 8, 10, 14, 6, 12

OR

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

	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** 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]
- CO-4
BL-3



Q-6 Do as directed (Any Two)

A Differentiate between 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. **[16]**

B Apply Hungarian 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 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]**