Nirma University

Institute of Technology

Semester End Examination (RPR), December - 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.

Section I

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

A CO-1 BL-2 Find the θ for the following recurrences: [8]

1. $f(n) = \frac{1}{3}n^3 + \frac{1}{2}n^2 + \frac{1}{6}n$
2. $f(n) = 27n^2 + 16n$

B CO-1 BL-2 What is the time complexity of minimum spanning tree algorithms such as prim's algorithm and kruskal's algorithm? In which situation do you prefer prim's algorithm rather than kruskal's algorithm and vice-versa. [8]

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

A CO-2 BL-3 Show that circuit satisfiability problem is NP-complete. [9]

B CO-2 BL-3 Differentiate with suitable examples: [9]
1. Dynamic Programing and Greedy Algorithm
2. TopDown Approach and Bottom up Approach

C CO-2 BL-3 What is amortized analysis of an algorithm? Find the amortized cost for extracting the minimum in Fibonacci-heap. [9]

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

A CO-3 BL-4 Illustrate the operation of Max-Heap Insert , to insert an element 10 in the given heap of elements : 15,13,9,5,12,8,7,4,0,6,2,1 [8]

B CO-3 BL-4 Can we improve the time complexity of multiplying large integers using Divide and Conquer? Prove your answer with suitable example of multiplying 981 X 1234 [8]

Section II

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

A CO-4 BL-3 Define how knapsack problem is solved by using dynamic programing approach? Consider n = 5, (w1, w2, w3, w4, w5) = (1, 2, 5, 6, 7), (v1, v2, v3, v4, v5) = (1, 6, 18, 22, 28) and maximum capacity of Knapsack is 10, find the optimal solution ? [8]

B CO-3 BL-6 **True / False with justification** [8]

1. The best case time complexity for Bubble sort is $O(n^2)$.
2. The Worst case time complexity for Binary Search is *nlogn.*
3. Time complexity for deleting an element from heap tree is *nlogn.*
4. Optimal binary search tree is a tree with highest frequency node as root

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

A CO-4 BL-6 For the following chain matrix multiplications, find out the optimal parenthesize? (Use Dynamic Programing approach) [9]

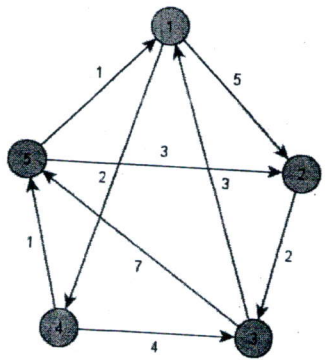
Matrix	Dimensions
A1	30 X 35
A2	35 X 15
A3	15 X 5
A4	5 X 10
A5	10 X 20
A6	20 X 25

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 For the following graph, solve all pair shortest path using Flloyd' Warshall algorithm and show that how it differs from Dijkstra Algorithm? [9]

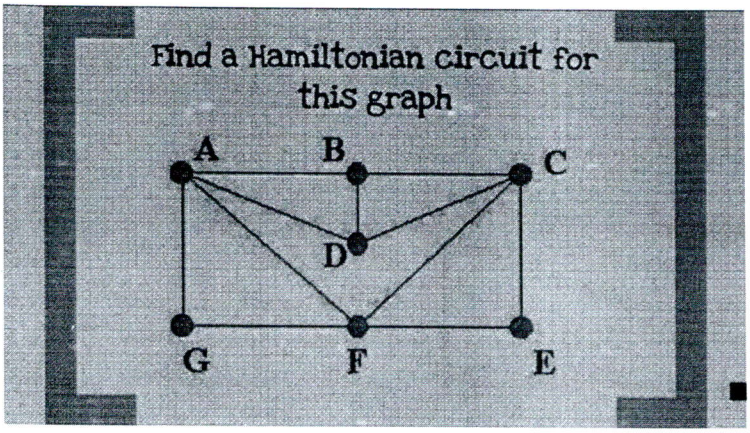


Q-6 Do as directed **[16]**

A CO-4 BL-5 Consider the travelling sales person instance defined by the following cost matrix. Obtain reduced cost matrix and solve TSP problem. [8]

∞	7	3	12	8
3	∞	6	14	9
5	8	∞	6	18
9	3	5	∞	11
18	14	9	8	∞

B CO-4 BL-5 Hamiltonian Path in an undirected graph is a path that visits each vertex exactly once. A Hamiltonian cycle (or Hamiltonian circuit) is a Hamiltonian Path such that there is an edge (in graph) from the last vertex to the first vertex of the Hamiltonian Path. Determine whether a given graph contains Hamiltonian Cycle or not using backtracking. If it contains, then print the path. [8]



OR

B 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]