NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA
THEORY EXAMINATION
Question Paper

Month and year: **Dec. 2019**
Program: **B.Tech.-CS**
Subject: **DAA**
Maximum Marks: **50**
Number of Questions to be attempted: **5**

Total no. of pages used: **2**
Semester: **III**
Course code: **CSPC-21**
Time allowed: **03 Hours**
Total No of Questions: **5**

Note 1: *Question No. 5 has an internal choice. Attempt any one part of it.*

Note 2: *Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, if any.*

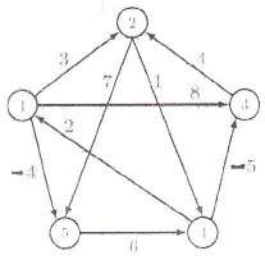
Q-1.	(a). Define Heap and analyze the complexity of min heap function.	2
	(b). Explain Prim's Algorithm for minimum Spanning tree. Also compute its time complexity.	2
	(c). Define B-Tree with its terminology. Also insert following in a B-Tree having order 3. 7, 3, 5, 11, 16, 4, 9, 2	2
	(d). How backtracking algorithm solves the Hamiltonian problem? Explain.	2
	(e). Write pseudo code to find strongly connected component in a graph.	2
Q-2.	(a). Solve following recurrence relation using recursion tree method. $T(n) = \begin{cases} 1 & if\ n = 1 \\ T(n) = T(n/3) + T(2n/3) + \theta(n). & if\ n > 1 \end{cases}$	3
	(b). What is graph coloring problem? Write the pseudo code to color a graph and also analyze its complexity.	3
	(c). Write the pseudo code to solve 8-queen problem using the backtracking algorithm. Show all the steps of 4-queen problem and analyze the complexity of n-queen problem.	4
Q-3.	(a). Prove the master theorem.	5
	(b). Write the algorithms to solve the rod-cutting problem. Also analyze its time complexity.	5
Q-4.	(a) Define the elements of the Dynamic Programming. Write all the steps to find the LCS of two string X = < ABCDGH> and Y = < AEDFHR>.	4
	(b) Write the pseudo code for Johnson's algorithm. Professor Greenstreet claims that there is a simpler way to reweight edges than the method used in Johnson's algorithm. Letting $w^* = \min_{(u,v) \in E} \{w(u, v)\}$, just define $\hat{w}(u, v) = w(u, v) - w^*$ for all edges $(u, v) \in E$. what is wrong with the professor's method of reweighting?	6

Q-5.	(a) What is task scheduling problem? Find optimal sequence of Jobs for following jobs using greedy algorithm.	3

Job	J_1	J_2	J_3	J_4	J_5
Deadline	2	1	3	2	1
Profit	60	100	20	40	20

(b). Find the optimal parenthesis of matrix chain multiplication where sequence of dimensions is A1:10×100, A2: 100×5, A3:5×50, A4:50×20 — 3

(c) Explain Floyd-Warshall Algorithm to find all pair shortest path. Find all pair shortest path of following problem also analyze its complexity. — 4



OR

(a) What is priority queue? Illustrate the operation of HEAP-EXTRACT-MAX on the heap A = <15, 13, 9, 5, 12, 8, 7, 4, 0, 6, 2, 1>. — 3

(b) Write the pseudo code for Huffman codes. Generate the Huffman code for following symbols. — 3

Symbol	a	b	c	d	e	f
Frequency	6	11	9	2	20	5

(c) Let $G = (V, E)$ be a weighted, directed graph with nonnegative weight function $w: E \rightarrow \{0, 1, \ldots W\}$ for some nonnegative integer W. Modify Dijkstra's algorithm to compute the shortest paths from a given source vertex s in $O(WV + E)$ time. — 4