NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA
THEORY EXAMINATION
Question Paper

Month and year: **Dec, 2020**
Program: **B.Tech** Semester: **3rd**
Subject: **Design and Analysis of Algorithms** Course code: **ITPC21**
Maximum Marks: **50** Time allowed: **02 Hours**

Note: Attempt all questions. All questions carry equal marks. Unless stated otherwise, the symbols have their usual meanings in context with subject. Assume suitably and state, additional data required, if any. The candidates, before starting to write the solutions, should please check the question Paper for any discrepancy, and also ensure that have been delivered the question paper of right **course no.** and right **subject title.**

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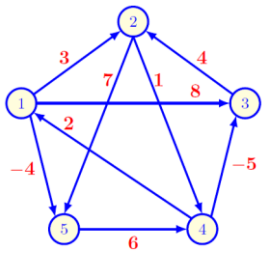
1. (a) Use the master method to show that the soultion to the binary-search recurrence $T(N) = T(\lfloor n/2 \rfloor) + \theta(1)$ is $T(N) = \theta(\lg n)$.
(b) Using the master method, you can show that the solution to the recurrence $T(N) = 4T(n/2) + n^2$ is $T(N) = \theta(n^2)$. Show that a substitution proof with the assumption $T(n) \leq cn^2$ fails. Then show how to subtract off a lower-order term to make a substitution proof work.

2. A) Explain the heap-sort algorithm along with its time complexity. Is the array with values <23, 17, 14, 6, 13, 10, 1, 5, 7, 12> a max-heap?
B) Explain the fundamental steps of finding longest common subsequence using dynamic programming. Find LCS between two strings X=BACDB and Y=BDCB.

3. Explain the Dijkstra's algorithm along with its time complexity. Give a simple example of a directed graph with negative-weight edges for which Dijkstra's algorithm produces incorrect answers.

4. Explain the Kruskal and Prim's algorithm with suitable example. Also, discuss their time complexities.

5. Explain Floyd-Warshall Algorithm to find all pair shortest path. Find all pair shortest path of following problem also analyze its complexity.



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