

# SSN College of Engineering

Department of Computer Science and Engineering

## CS1403 — Design and Analysis of Algorithms

2019 – 2020

**Session — 10**

February 26, 2020

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- This homework is due by 4pm on February 26, 2020
  - Grace period may be given up to midnight of February 27, 2020
  - You can upload only one ZIP file
  - The naming convention is “<Your first name (first letter capital and all the other letters small)>-CS1403-S10.zip”
  - The questions marked as “OPTIONAL” are, as the name implies, optional! Complete your core assignment first and attempt the optional problem only if you have sufficient time.
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1. Problem 1: Given a directed graph  $G = (V, E)$ , find the reachability between any two pair of vertices.  
Problem 2: Given a weighted directed graph  $G = (V, E)$ , find shortest weighted paths between every pair of nodes.
  - (a) Implement a dynamic programming algorithm to find the transitive closure of a given directed graph  $G = (V, E)$ .
  - (b) Given a weighted directed graph  $G = (V, E)$ , find shortest weighted paths between every pair of nodes using your code for Dijkstra’s algorithm.
  - (c) Given a weighted directed graph  $G = (V, E)$ , find shortest weighted paths between every pair of nodes using dynamic programming. Your algorithm should report both the shortest path and distance for every pair of vertices.
  - (d) (OPTIONAL) Perform empirical analysis with graphs of different sizes to check which of the two algorithms run faster to solve the all-pairs shortest paths problem.