

SSN College of Engineering

Department of Computer Science and Engineering

CS1403 — Design and Analysis of Algorithms

2019 – 2020

Session — 12

March 11, 2020

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- This homework is due by 4pm on March 11, 2020
 - Grace period may be given up to midnight of March 12, 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-S12.zip”
 - The questions marked as “OPTIONAL” are, as the name implies, optional! Complete your core assignment first and attempt the optional problems only if you have sufficient time
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1. Given an undirected graph $G = (V, E)$, a **Hamiltonian circuit** is defined as a simple cycle that passes through all the vertices of G exactly once.
 - (a) Formulate the problem of finding a Hamiltonian circuit in a graph in state-space approach, using permutations of sequence of vertices.
 - (b) Implement a backtracking algorithm to find a Hamiltonian circuit in a given graph. Use your permutation based formulation for this implementation.
 - (c) Provide an alternate formulation in the state-space approach, that enables early pruning.
 - (d) Implement a backtracking algorithm, that enables pruning of the search tree, to find a Hamiltonian circuit in a given graph.
 - (e) (OPTIONAL) Perform empirical analysis to check which of these two algorithms run faster to find a Hamiltonian circuit.
 - (f) (OPTIONAL) Extend both the implementations to find all the Hamiltonian circuits in a given graph.
 - (g) (OPTIONAL) Assume that every edge in the graph is associated with a cost. Extend your implementations to find the minimum cost Hamiltonian circuit.