

Design and Analysis of Algorithms
Spring 2018
Section C, D and E
Assignment 5
Submission Date: May 3, 2018

Problem 1:

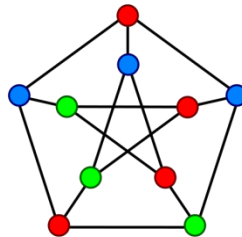
The **square** of a directed graph $G(V, E)$ is the graph $G^2(V, E^2)$ such that $(u, v) \in E^2$ if and only if G contains a path with at most two edges between u and v . Describe efficient algorithms for computing G^2 from G for both the adjacency list and adjacency-matrix representations of G . Give complete pseudo code of your algorithm and analyze the running times.

Problem 2:

Let $Nsum[v]$ be the sum of degrees of all the neighbors of a vertex v in an undirected graph $G(V, E)$. Find a linear time algorithm to compute the value of $Nsum$ for all vertices in G . Give complete pseudo code of your algorithm.

Problem 3:

A graph $G(V, E)$ is k -colorable if k different colors are enough to color the vertices of the graph such that no two adjacent vertices share a common color. Below is an example of 3-colorable graph.



Develop a linear time algorithm which determines whether a given undirected graph G is 2-colorable or not. Give complete pseudo code of your algorithm.

Problem 4:

Solve the problem 23-1(second best minimum spanning tree) in the text book “Introduction to Algorithms” by CLR

Important Note:

Do mention your roll number and section on the home work. Your submitted work must be your own contribution. Any sort of plagiarism will be punished severely.