INDIAN STATISTICAL INSTITUTE

M. Tech (CS) - I Year, 2016-2017 (Semester - II)

Design and Analysis of Algorithms

Assignment-2: Programming Assignment

Submission: The assignment is being uploaded on 06.03.2017. You have to submit the assignments by e-mail to `algo2017mtech@gmail.com` by 26.03.2017. The subject line of the e-mail should be *Assignment 2*. If you are submitting a multifile program, submit a *zip* or *tar ball* having all the files with the following naming convention. As an example, if you are an M Tech (CS) student whose name is Shyam Mondal, your file names should be mtech-shyam-assign2-***. If you are a JRF whose name is Shyama Mondal, your file names should be jrf-shyama-assign2-***. Ideally, we would prefer a shell script in your folder, so that while checking the assignments, we can run only the shell script.

Note: Implementations need to be in C/C++. For plotting purposes, you can use gnuplot.

Copying, in any form, will be considered a serious offence. Copying, if detected for a particular assignment will attract negative marks for that assignment, i.e., it will deduct marks from some marks obtained rightfully in other assignments/tests.

(Q1) Write recursive and iterative implementations for the following algorithms:

- breadth first search in a directed graph and undirected graph
- depth first search in a directed graph and undirected graph

Given any edge, your program should be able to classify the edge (e.g. tree edge, back edge, forward edge, cross edge, etc.)

(Q2) Write a program to detect the following:

- all *cut vertices* in a directed graph and undirected graph
- all *bridges* in a directed graph and undirected graph
- all *strongly connected components* in a directed graph

(Q3) Write programs for:

- *topological sort* for a *directed acyclic graph* (DAG)
- finding the shortest and longest paths between any two vertices in the DAG
- finding the average path length between any two vertices in the DAG.