CS 6340 – Fall 2009 – Problem Set 8   Name_____
Assigned: October 20, 2009
Due: October 27, 2009

At the beginning of class on the due date, submit your neatly presented solution with this page stapled to the front (100 pts). As with the previous assignments, you are to do this assignment individually.

Part 1
Given the control-flow graph for a program shown in slide 5 of Basic_Analysis_2.pdf from 8/20 of class schedule (http://www.cc.gatech.edu/~harrold/6340/cs6340_fall2009/Slides/BasicAnalysis2.pdf)

1. Use the Ball/Larus technique for efficient path profiling to determine where to instrument the program.   Show the results of each of the following steps.
    a. Compute the *reverse topological ordering* that will be used for Step 1 of the algorithm.
    b. Rewrite the graph so that it is *acyclic* and in the form needed by the algorithm.
    c. Step 1. Compute *NumPaths(v)* for each vertex in the graph and *Val(e)* for each edge in the graph. Show all steps in the computation and show the resulting graph with these values shown.
    d. Step 2. Create a spanning tree for the acyclic graph and determine the *chords* in the graph (the edges to instrument), and assign increment values to the chords
    e. Step 3. Select appropriate *instrumentation* to get the increments from Step 2.
2. Given integers 1, 3, and 5, determine, using (2), which paths are traversed.

Part 2
Suppose our instrumentation provides the acyclic paths that are covered in a program. From these acyclic paths, we want to infer information about all-uses coverage—using the paths that are covered, find coverage of def-c-uses and def-p-uses.
1. Will the acyclic paths let us identify measure all-uses coverage?
    a. If so, how would you do it?
    b. If not, what would be missed? Describe the kinds of def-c-uses and def-p-uses that could not be identified using the acyclic paths
2. Develop an algorithm that would use acyclic paths, and possibly other information, to measure all-uses adequacy in the program.