LSU EE 4720 **Homework 2** **Due: 9 March 2007**

Problem 1: A manufacturer develops an ISA extension which can dramatically improve the performance of certain benchmarks. The extension includes new instructions which work well with small integers. In what the manufacturer calls well-formed C programs the compiler will find all opportunities where the new instructions can be used and so the dramatic improvement will be realized. On other programs in which the new instructions could be used the compiler won't use them because it can't tell if the resulting machine code would be correct (perhaps because its not sure if values in registers would be small). In such cases the compiler will provide a message for the programmer indicating a list of regions in which there was the possibility of using the instructions. The programmer can then recompile with a special option indicating which of those regions the new instructions can safely be used in. The resulting code would be sped up.

Suppose this all works out very well for developers. They have no problems indicating which regions are safe for the new instructions and their resulting executables are fast and run correctly.

The manufacturer would like to run the SPECcpu2006 benchmarks on their new implementation. Most of the SPECcpu2006 benchmarks are not well formed.

(*a*) Why couldn't the compiler options (flags) for the SPEC run (base or peak) indicate the safe regions under a reasonable interpretation of the rules? In your answer refer to specific parts of the SPECcpu2006 run and reporting rules,
`http://www.spec.org/cpu2006/Docs/runrules.html`.

(*b*) Keeping in mind the goals of the SPECcpu benchmarks argue either that the SPECcpu rules should be changed (perhaps for a future version of the benchmark) or argue that the rules should remain as they are.

Solve the problems below. Then look at the solutions and assign yourself a grade.

Problem 2: Without looking at the solution solve Spring 2006 Midterm Exam Problem 1.

Problem 3: Without looking at the solution solve Spring 2006 Midterm Exam Problem 2.