

*Links in this assignment are clickable in Adobe Reader. For the questions below refer to the gcc 4.1.2 manual, available via <http://gcc.gnu.org/onlinedocs/gcc-4.1.2/gcc/>.*

**Problem 1:** Read the introductory text to the optimization options page, 3.10, in the GCC 4.1.2 manual, and familiarize yourself with your Web browser's search function so that you can search the rest of the page. Answer the following questions.

(a) When optimizing gcc tries to fill branch delay slots. What option can be used to tell gcc not to fill delay slots, without affecting other optimizations? What option can be used to control how much effort gcc makes to fill delay slots?

(b) A reason given in class for scheduling code was to avoid stalls due to a lack of bypass paths. What reason is given in the description of the `-fschedule-insn` option?

**Problem 2:** The POWER and PowerPC ISAs have a lot in common, but each has instructions the other lacks. Show the gcc command line switch to compile for both, start looking in section 3.17, Hardware Models and Configurations.

**Problem 3:** Read the following blog post about the use of profiling in the build of the Firefox Web browser:

<http://blog.mozilla.com/tglek/2010/04/12/squeezing-every-last-bit-of-performance-out-of-the-linux-toolchain/>. ■

The post compares the results of profiling optimizations provided by gcc to those obtained using other tools for optimization.

(a) As described in the blog post, what was the training data used for profiling?

(b) Suppose that a Web page with a 5000-row table performs just as sluggishly with the profile-optimized gcc build described in the blog post (`firefox.static.pgo`) as the ordinary Firefox build (`firefox.stock`). Provide a possible reason for this, and a solution.

**Problem 4:** SPEC recently ended a call for possible programs for their next CPU suite, `cpuV6`. Read the page describing the call: <http://www.spec.org/cpuV6/>.

(a) There is a section entitled "Criteria SPEC considers important for the next CPU benchmark suite." Evaluate the suitability of the `pi.c` program used in class based on each of these criteria.