**Chapter 15 - Exercises**

15.1. What are some typical distinguishing characteristics of RISC organization?

**(1) a limited instruction set with a fixed format, (2) a large number of registers or the use of a compiler that optimizes register usage, and (3) an emphasis on optimizing the instruction pipeline.**

15.2. Briefly explain the two basic approaches used to minimize register-memory operations on RISC machines.

**Two basic approaches are possible, one based on software and the other on hardware. The software approach is to rely on the compiler to maximize register usage. The compiler will attempt to allocate registers to those variables that will be used the most in a given time period. This approach requires the use of sophisticated program-analysis algorithms. The hardware approach is simply to use more registers so that more variables can be held in registers for longer periods of time.**

15.3. If a circular register buffer is used to handle local variables for nested procedures, describe two approaches for handling global variables.

**(1) Variables declared as global in an HLL can be assigned memory locations by the compiler, and all machine instructions that reference these variables will use memory-reference operands.  
(2) Incorporate a set of global registers in the processor. These registers would be fixed in number and available to all procedures.**

15.4. What are some typical characteristics of a RISC instruction set architecture?

**One instruction per cycle. Register-to-register operations. Simple addressing modes. Simple instruction formats.**

15.5. What is a delayed branch?

**Delayed branch, a way of increasing the efficiency of the pipeline, makes use of a branch that does not take effect until after execution of the following instruction.**

**Answers to Questions**