2 Compiler Construction (jdy22)

You have acquired an old computer, and you would like to write programs for it in C. Unfortunately, the computer has no executable C compiler: it has only a Lisp compiler lispc.exe (an executable that uses the machine’s instruction set MIS):

and the source code for a C compiler cc.c (written in C):

(a) You would like to get the C compiler running efficiently on your computer with as little programming as possible. A useful first step is to write a quick-and-dirty C-to-Lisp compiler in Lisp:

What further steps are needed? Describe and illustrate each step using the same illustration scheme as above.

[8 marks]

(b) You would like to extend the C compiler to support foreign function calls so that your C programs can use libraries compiled by lispc.exe.

(i) What information from the Application Binary Interface might you need to ensure that foreign calls work correctly? Comment on function calls, on the stack, on object layout, and on any other relevant considerations.

[6 marks]

(ii) Programs written in Lisp use a garbage collector (GC) to reclaim unreachable objects. Explain how the GC determines reachability, how calls between C and Lisp might affect the reachability check, and what changes are needed to make the check work in the presence of those calls.

[6 marks]