

1999 Paper 7 Question 4

Optimising Compilers

Define the notion of a program expressed as a flowgraph of three-address instructions being in *single static assignment* (SSA) form. [4 marks]

Given a program expressed in a language like C, explain how one might deal with

(a) temporaries used to express a complicated expression as a sequence of three-address instructions, and

(b) (non-address taken) formal parameters and local variables

so that the resulting flowgraph is in SSA form. [6 marks]

Give a program for which performing a “map to SSA form” pass before register allocation is likely to result in better code, noting any assumptions you make on how register allocation works. [5 marks]

Commonly SSA form is discussed only for temporaries and non-address-taken local variables. To what extent is it possible to arrange that accesses to address-taken locals or statically allocated global variables can be transformed into SSA form? What effect might such a transformation have on register allocation of such variables? [5 marks]