1995 Paper 8 Question 7

Optimising Compilers

Explain what is meant when a token α is said to be *live* at some point in a flow graph. [4 marks]

Carefully describe an algorithm to compute the live sets from the *gen*, *kill* and *null* sets at each point in a flow graph, and discuss its efficiency in terms of the number of nodes in the flow graph. [6 marks]

Describe an algorithm to calculate the sets of tokens $C_x(n)$ and $J(n)$ where

$$\begin{aligned} \alpha \in C_x(n) &\iff P(n;\alpha) \equiv x\rho + \rho' \\ \alpha \in J(n) &\iff P(n;\alpha) \equiv \rho + 1 \end{aligned}$$

assuming that x, y and z are some permutation of the actions d, r and u (denoting definition, reference and undefinition). [5 marks]

Show how to calculate the set $B_x(n)$ from $C_x(n)$, $C_y(n)$, $C_z(n)$ and $J(n)$ where

$$\alpha \in B_x(n) \iff P(n;\alpha) \equiv x\rho + 1$$ [5 marks]