1999

Optimising Compilers

p8q7
AM

Model Answer

Part 1: bookwork. Letting $2 = \{0, 1\}$ then the strictness space for a k-adic function is $2^k \to 2$.

$$plus^{\#}(x, y) = x \wedge y$$

$$cond^{\#}(p, x, y) = p \wedge (x \vee y)$$

f is strict in ith arg if $f^{\#}(1, ...1, 0, 1, ..., 1) = 0$.

Part 2:

$$(\text{SUB})\frac{\Gamma \vdash f : \mathtt{int}^k \xrightarrow{S} \mathtt{int}}{\Gamma \vdash f : \mathtt{int}^k \xrightarrow{S'} \mathtt{int}} \text{ if } S \subseteq S'.$$

Part 3 (requires thought)

$$plus : \mathtt{int}^2 \xrightarrow{\{1\}} \mathtt{int}$$
$$plus : \mathtt{int}^2 \xrightarrow{\{2\}} \mathtt{int}$$
$$cond : \mathtt{int}^3 \xrightarrow{\{1\}} \mathtt{int}$$
$$cond : \mathtt{int}^3 \xrightarrow{\{2,3\}} \mathtt{int}$$

Part 4:

$$\Gamma \vdash f : \mathtt{int}^k \xrightarrow{\{i\}} \mathtt{int}$$