

## 2003 Paper 10 Question 9

### Computation Theory

What is meant by a *register machine*? Explain the action of a register machine program. [6 marks]

What does it mean for a partial function  $f(x_1, \dots, x_n)$  of  $n$  arguments to be *register machine computable*? [3 marks]

Design register machines to compute the following functions.

$$f(x_1, x_2) = x_1 + x_2 \quad [2 \text{ marks}]$$

$$g(x_1) = \begin{cases} 42 & \text{if } x_1 > 0 \\ \text{undefined} & \text{otherwise} \end{cases} \quad [2 \text{ marks}]$$

$$h(x_1) = 2^{x_1} \quad [4 \text{ marks}]$$

Give an example of a function that is not register machine computable, stating clearly any well-known results you use. [3 marks]