

## 2006 Paper 1 Question 8

### Operating Systems

- (a) Devices are ultimately connected to the CPU via a *bus*.
- (i) What are the main components of a bus? [3 marks]
  - (ii) Describe how the CPU uses a bus to communicate with a device. [3 marks]
  - (iii) How does the situation become more difficult when we have DMA-capable devices? [2 marks]
  - (iv) Why does a typical computer have more than one bus? [2 marks]
- (b) A programmer at MegaCorp is given the task of optimising a program for which no source code exists; all that is available is an executable file.
- (i) How could the programmer modify the operating system to work out which parts of the program are executed frequently, and thus might be candidates for optimisation? [4 marks]
  - (ii) The programmer determines that the slowest parts of the program involve loops which perform repeated integer multiplications, and where the multiplicand is always either 8 or 15. How could the program be modified to use faster ALU operations instead? [6 marks]