

## 2003 Paper 10 Question 6

### Operating System Foundations

- (a) (i) What is meant by the *address space* of a process?
- (ii) Give an example of how a 32-bit address space might be allocated between the various components of user and operating system (OS) code and data. You may assume that the OS occupies half the address space of every process.
- (iii) Why does the OS region containing memory-mapped I/O interfaces need to be distinguished? What is the alternative to memory-mapped I/O?
- (iv) How might the fact that much OS code must be permanently resident in memory be used to advantage?
- (v) How is the OS protected from user level code at runtime?
- (vi) How is the OS executed synchronously via calls from user level?

[13 marks]

- (b) In what way did the provision of a protected address space per process affect the development of operating systems? Describe the hardware and software support for the development you mention in some detail. [7 marks]