Operating System Foundations

Operating systems are integrated closely with the hardware on which they run.

(a) Distinguish the hardware and software involved in interrupt-driven I/O. [4 marks]

(b) Describe three uses of the interrupt mechanism in addition to device I/O. [3 marks]

(c) Give examples of how the privilege state bit in a CPU’s status register is used. [2 marks]

(d) (i) What could go wrong in a system that does not make use of a timing device in process scheduling? [1 mark]

(ii) What class of scheduling algorithms would be impossible to implement without a timing device? [2 marks]

(e) What is the main advantage of using half the virtual address space of a process for the operating system and half for applications? [1 mark]

(f) Explain memory-mapped I/O. [2 marks]

(g) In a paging system, would you expect every page of the operating system address space to be:

(i) mappable in the Translation Lookaside Buffer (TLB)? [2 marks]

(ii) capable of being cached? [1 mark]

Explain your answers.

(h) How do DMA (Direct Memory Access) devices operate? [2 marks]