2010 Paper 2 Question 4

Operating Systems

(*a*) The virtual address space of a UNIX V7 process contains a *text segment*, a *data segment* and a *stack segment*.

   (*i*) What is contained in the text segment? How does this change as the process executes? [2 marks]

   (*ii*) What is contained in the data segment? How does this change as the process executes? [2 marks]

   (*iii*) What is contained in the stack segment? How does this change as the process executes? [2 marks]

(*b*) The UNIX kernel is also present in the virtual address space of every process. Describe how the operating system can ensure that this memory region is protected from access by an executing process. Under what circumstances can a process gain access to this region of virtual memory? [2 marks]

(*c*) Compare and contrast *blocking*, *non-blocking* and *asynchronous* I/O.
[2 marks each]

(*d*) You are asked to write a device driver for a hard-disk drive.

   (*i*) Under what circumstances will you issue requests to the drive? [2 marks]

   (*ii*) What steps will you need to take when an interrupt occurs? [2 marks]

   (*iii*) Given that the hard-disk drive is not really a random access device, what steps could you take to improve performance? [2 marks]