2007 Paper 11 Question 12

Operating System Foundations

(*a*) Each object named in a filing system has associated with it a fixed-length metadata record (file control block). Describe *three* ways in which the disk blocks allocated to a file have been recorded, as part of its metadata, in various filing systems. State the good and bad properties of these approaches.

[9 marks]

(*b*) (*i*) What is meant by a *hard link*? [2 marks]

(*ii*) Can a file or directory have no hard links? Explain. [1 mark]

(*c*) Filing systems make use of an in-memory cache of disk blocks. This is a shared data structure, accessed by device drivers and processes carrying out application-level requests for I/O.

(*i*) What are the advantages and disadvantages of not writing synchronously to disk? [2 marks]

(*ii*) Discuss why both mutual exclusion and condition synchronisation are needed for this data structure. [4 marks]

(*d*) One filing system names the blocks in its disk-block cache as filing-system-ID, block-number. In another, the blocks are offsets within a file. What are the implications of these approaches? [2 marks]