

A13937

THIS IS NOT AN OPEN-BOOK EXAMINATION.
CANDIDATES MAY NOT CONSULT ANY REF-
ERENCE MATERIAL DURING THE SITTING.

NO CALCULATOR PERMITTED IN THIS EXAMI-
NATION

THE UNIVERSITY OF BIRMINGHAM

Degree of B.Sc. with Honours

Computer Science/Software Engineering. Second Examination.

Computer Science/Software Engineering with Business Studies. Second Examination.

Artificial Intelligence and Computer Science. Second Examination.

Degree of BEng/MEng with Honours

Computer Science/Software Engineering Second Examination.

Joint Degree of MEng with Honours

Electronic and Software Engineering. Third Examination.

Joint Degree of B.Sc. with Honours

Mathematics and Computer Science. Second Examination.

Degree of MSc in Computer Science.

Occasional Computer Science/Software Engineering

06 15258

Operating Systems

May 2005 2 hours

[Answer ALL questions]

Turn Over

1. (a) Explain the role of interrupts in handling I/O-requests in an operating system. [4%]
(b) Consider the following I/O-scenarios.
 - A sensor for a robot
 - A printer
 - A CD-ROM
 - A keyboardFor each of these I/O-scenarios, would you design the operating system so that it uses buffering, spooling, caching or a combination? Justify your answer. [12%]
(c) Writers of computer games would like to bypass the operating system and have direct access to the graphics card to improve the speed of the games. Is it possible to grant such access without compromising security? Justify your answer. [6%]
2. (a) Explain how paging works. [7%]
(b) A debugger is a program that executes chosen parts of another program and permits examining and changing the value of its variables. How would you use segmentation and/or paging to support such debuggers? [8%]
(c) How do you ensure that debugging programs which grant administrative privileges temporarily cannot be used to obtain unrestricted administrator access? [5%]
3. (a) Give an algorithm to establish a logical ring in a network where all nodes are connected via ethernet. [8%]
(b) Give an algorithm for re-organising the local ring if a new node joins the network. Your algorithm should not use any timeouts. [5%]
(c) How can you re-organise the local ring if a given node fails? [5%]
4. (a) Describe the possible states of a process and the transitions between them. [6%]
(b) A department runs its Java teaching on a set of workstations running Linux. These workstations are also used for running compute-intensive research jobs. Describe an appropriate scheduling policy for this situation and justify why it is appropriate. [7%]
(c) Now assume that some of the workstations are also used to run memory-intensive multimedia applications. How would you modify the scheduling policy described above? [5%]

5. (a) Describe UNIX file protection bits. [6%]
- (b) A team is working on a software project. Team members have to have read access to all files created but only one team member should be able to modify a particular file at a time. This person should be able to transfer the permission to modify these files to another team member. The manager should have full control over all files. Describe how to implement such a system using access control lists and UNIX protection bits as far as possible. [10%]
- (c) Capability lists are usually kept within the address space of the user. How does the operating system ensure that the user cannot modify the contents of the list? [6%]