

A06470

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

NO CALCULATOR PERMITTED IN THIS EX-  
AMINATION

**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 02500

**Operating Systems**

May 2002 2 hours

[Answer ALL questions]

Turn Over

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1. (a) List two prerequisites for scheduling algorithms to be successful and justify their necessity. [6%]
- (b) Assume a compute server is used for both Computer-Aided Design systems which are very CPU-intensive and require a short response time and for compiling and editing programs. For each of the scheduling algorithms FCFS, Round Robin, Multilevel-Queue Scheduling and Priority Scheduling, indicate whether it is suitable for this scenario. Justify your answer. [12%]
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2. (a) What is the difference between paging and segmentation? [6%]
- (b) A multi-user system using a working-set model to allocate pages to processes has been working satisfactorily so far. Now the addition of several processes continuously accessing all areas of its allocated memory causes a drastic performance loss: the hard disk is in constant use, and response time has increased significantly. Give a possible cause for this behaviour and suggest a remedy. [8%]
- (c) Argue why the page replacement algorithm that removes the page to disk which is not needed for the longest time (or not needed at all) minimises the number of page faults for each given sequence of page requests. [8%]
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3. (a) Describe the LOOK-algorithm for disk scheduling. [6%]
- (b) All modern operating systems maintain a disk cache in main memory containing the data of some disk block entries in main memory. Describe the effects of a sudden loss of power on such a system. [7%]
- (c) Describe the effect on performance of balancing filesystem I/O among the disks in a multitasking environment. [7%]
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4. (a) Describe how file access via NFS works. [7%]  
(b) Assume one client was in the middle of writing a large file on an NFS-server when the server went down. After the server was rebooted another client tries to write to the same file. Is there some way of warning this client about the attempted writing by the first client? Justify your answer. [8%]
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5. (a) Describe access control lists as a model of protection. [6%]  
(b) Students work on a group software project. Members of the team should have read-access to all the files belonging to the project but only one member should be allowed to modify any file at any time. After the final deadline for hand-in all files should be made read-only for all members of the team and the lecturer who marks the work. No other person should have any access to the files. Describe how you would use UNIX protection bits and access control lists to implement this. [12%]  
(c) Is it possible to run a multi-user system with authentication if any process can access any part of the memory? Justify your answer. [7%]