

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 2004 2 hours

[Answer ALL questions]

Turn Over

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1. (a) New hardware usually requires new drivers, which often must be installed on the computer. Are system administrator privileges required for such an installation? Justify your answer. **[8%]**
- (b) Errors in hardware drivers are responsible for a large percentage of operating system errors, which often cause the system to hang. Is it possible to write device drivers in such a way that this cannot happen, even if the device driver code is faulty? Justify your answer. **[8%]**
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2. (a) List two prerequisites for scheduling algorithms to be successful and justify their necessity. **[8%]**
- (b) Assume a compute server is used for both running large interactive simulations, 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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3. (a) What is a working set of a process? **[7%]**
- (b) A multi-user system used to work well, with low response times and good throughput. Now many more users are using the system, and as a result the response time is high, and throughput low. How would you distinguish between overloaded CPU, thrashing and overused disk as a possible reason? **[10%]**
- (c) A frequent programming error used by trojan horses is the so-called “buffer overflow”: if an array boundary is exceeded, the return address of procedures can be changed to any value, and hence arbitrary code can be executed. Describe how to use segmentation or paging to make such attacks impossible. **[8%]**
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4. (a) Give a sequence of messages which shows that the following protocol fails to guarantee mutual exclusion:
- Host A sends a broadcast request to all hosts on the network, asking whether anyone is interested in entering the critical section
 - Any host receiving such a message sends a message back to host A if it is not in the critical section. If it is in the critical section, it waits until it has completed it, and then sends a message to Host A.
 - Host A enters the critical section if it has received a message from every other host on the network.
- [8%]**
- (b) Suggest a change to the protocol which ensures mutual exclusion and justify why it ensures mutual exclusion .
- [8%]**
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5. (a) Describe the Bully algorithm for election of coordinators. **[7%]**
- (b) Consider a set of networked PCs, with none distinguished from the others. How would you find out which resources (printers, scanners etc.) are available on the network? **[8%]**
- (c) Can you suggest a more efficient way of finding out which resources are available? **[8%]**
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