A13937

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NO CALCULATOR PERMITTED IN THIS EXAMINATION

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 2003 2 hours

[Answer ALL questions]

Turn Over

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1. (a) What is virtual memory? **[7%]**

   (b) Consider the following page reference string:

   $$1, 2, 3, 4, 5, 7, 1, 6, 2, 4, 3$$

   List the page faults that would occur for the first-in, first-out algorithms and the optimal algorithm assuming four frames. All frames are initially empty, so your first access to each page will cost one fault. **[8%]**

   (c) A University department has decided that, for the ease of management, all applications should run on a central compute server. It has been observed, when large numbers of students simultaneously work on their programming exercise, response time increases considerably and starting up new programs takes a very long time. The time to download large data files is not affected. Explain the reason(s) for this slowdown, and suggest a remedy. **[8%]**

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2. (a) Describe the possible states of a process and the transitions between them. **[8%]**

   (b) A workstation has a CD-writer attached to it. The CD-writer only works properly if it is supplied with data at a constant high rate. Describe the problems that arise if a Round-Robin scheduling policy is used, and the operating system uses virtual memory. **[8%]**

   (c) Describe modifications of the scheduling policy and the use of virtual memory which would solve the problems identified in part (b). **[8%]**

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3. (a) Describe the LOOK-algorithm for disk scheduling. **[7%]**

   (b) All operating systems include open- and close-system calls for file access. Why is this the case? **[8%]**

   (c) Data for embedded devices are often stored on flash cards, which are devices allowing random access to all data with equal speed. Assume a file system is stored on such a flash card. Describe a suitable scheduling algorithm for accessing files on such a flash card. **[8%]**

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4. (a) Explain how a remote procedure call works. **[7%]**

   (b) Assume all files for a database reside on a central file server mounted via NFS, whereas the database application resides on the local workstation. Assume furthermore that the database is accessed from several workstations at the same time. To ensure consistency it is essential that only one person can modify the database at the same time. Is this possible in the given setup? Justify your answer. **[8%]**

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5. (a) How does buffering for I/O-operations work? **[7%]**

   (b) Consider a traffic signal camera for registering car number plates. Assume it can transmit large numbers of pictures very quickly. The camera is connected to a computer which processes the pictures and stores the registration numbers with the time the car passed the camera. To process the interrupts generated by the camera, would you use buffering, caching or spooling or some combination of these three methods? Justify your answer. **[8%]**