UNIVERSITY OF DUBLIN

TRINITY COLLEGE

Faculty of Engineering and Systems Sciences
Department of Computer Science

BA Mod. (Computer Science) Trinity Term 1998
JS Examination

3BA3 - Systems Software and Data Communications

Tuesday 26th May Luce Hall 14.00 - 17.00

Peter Given and Brendan Tangney

Attempt **five** questions at least two questions from each section.
Please use separate answer books for each section.

Section A

Q1. (i) What is the function of the Unix buffer pool? Why does the buffer pool use a Least Recently Used algorithm? Describe the kernel data structures used to maintain the buffer pool and show how the LRU policy is implemented.

(ii) The *GetBlk* algorithm returns a locked buffer from the buffer pool. List the different possibilities which can occur when the kernel tries to assign a buffer to a process.

Q2. (i) Processes sleep awaiting a particular system resource to become free. Show the pseudo-code for the sleep algorithm and explain what is occurring at each step in the pseudo-code.

(ii) Show in your algorithm the point where the kernel raises the processor execution level to prevent interrupts. Explain how the kernel may be corrupted if the processor didn't raise the execution level at this point.

Q3. (i) Explain demand paging and the principles behind it.

(ii) Unix System V uses a number of data structures in the implementation of demand paging. Describe these data structures and explain how they are used in the implementation of demand paging.

Q4. (i) Explain the Indexed Sequential Access Method (ISAM) file organisation technique.

(ii) Explain two of the following methods of inserting records into a sequential file:

- Deferred insertion
- Distributed free space
- Overflow
- Cellular splitting

Section B

Q5. i) Contrast, in detail, how the BSC and CSMA/CD protocols handle the three issues of error handling, flow control and sharing the medium.

ii) If the error rates on local area networks were significantly higher, what changes, if any, would have to be made to the CSMA/CD protocol?

Q6. i) Describe in detail how the communication medium is shared in the FDDI media access protocol.

ii) Briefly sketch the monitor election algorithm in Token Ring networks.

Q7. i) What are the problems that arise in data communications and how do layered protocol architectures give a framework for solving those problems? Illustrate your argument using the two philosophers example.

ii) Did the ISO do a good job in standardizing upon a 7 layer model in OSI?

Q8. Answer **each** of the following.

i) In what important ways is Differential Manchester different from simpler encoding techniques like NRZ?

ii) State Shannon's Law and Nyquist's Formula.

iii) What allows xDSL technologies to achieve much higher data rates than traditional modems?

iv) What modifications, if any, are required for CSMA/CD to operate as a wireless network?