

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY
SEMESTER II EXAMINATIONS 2000
SECOND YEAR INFORMATION TECHNOLOGY

CT213 – Computer Systems and Organisation

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Time Allowed: Three Hours

Answer question 1 and 3 others, with at least 1 from each section.

Section I

1. What is a computer Operating System, and how does it function?

In the light of your last answer, compare and contrast the UNIX and Windows NT operating systems.

In Unix, what sequence of commands would you type to list all the files in your home directory, directing the output into a file called list? How would you remove only those files ending in .doc in that directory?

2. Discuss the operation of the CPU Scheduler in allocating processes the CPU – mention process states, context switching, preemptive/nonpreemptive scheduling, and the various scheduling algorithms in your answer.

What is a thread? What are the advantages to using them in a modern operating system.

Say you run the netscape browser in Unix, and sometime later, it 'locks'. From another Unix shell window, how would you go about identifying its p.i.d. number and then kill it (remove it from the system)?

3. What is a critical section, and why is it called this? In what way is the concept of the critical section related to race conditions?

Discuss various hardware and software methods to limit the latter. Compare and contrast direct and indirect methods of inter-processor communication (IPC). Why is such activity necessary in a modern operating system?

Indicate how you would implement an IPC strategy for the Producer-Consumer scenario, giving reasons.

4. Write short notes on the following; frames, pages, segments. How are these related? How would you define virtual memory with respect to these three?

What is a page fault? What algorithms exist for both page replacement and allocation in order to limit these faults?

Discuss the problem of thrashing in this regard. How would you know if one of your programs was 'thrashing' on a UNIX machine? How would you go about dealing with it? (Contacting the system administrator is not the correct answer in this case!).

Section II

5. Write short notes on the following; bus types, bus width, multilevel bus heirarchies, bus arbitration.

What are the advantages and disadvantages of synchronous and asynchronous timin in bus design and implementation. Do you think the CPU clock frequency has a bearing in the choice of the latter?

Discuss the operation of, and appropriate application of, the Peripheral Component Interconnect Bus.

6. Discuss the problem of error correction in Semiconductor Main Memory.

Outline the role of cache in the memory heirarchy. Discuss the various mapping and replacement algorithms typically incorporated by designers when caching is used.

What is meant by cache coherency, and how is this coherency typically maintained.

7. How is instruction pipelining implemented in modern CPU architectures, and clearly illustrate why it is advantageous.

What potential problem areas exist with pipelines, and what steps must be taken to assure optimum pipeline operation?

Write short notes on superpipeline and superscalar pipeline designs.

8. Compare and contrast RISC and CISC architectures.

Control Unit technology within the CPU can either be microprogrammed or hardwired. Indicate how both of these technologies function, and mention the pros and cons of each.

What kind of CPU architecture would you incorporate into a PDA (Personal Digital Assistant – a hand-held computer) or a mobile phone? Give reasons for your answer.