

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND

COLÁISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE CORK

Summer Examinations 2014

BSc (Single Honours) II
Computer Science

CS2506 Operating Systems II

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Answer all questions
Total Marks 80

Time 1.5 Hours

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TO DO SO**

ENSURE THAT YOU HAVE THE CORRECT EXAM PAPER

1. Processes and threads are the execution entities managed by the operating system.
 - a. A process can create new processes or generate more threads. Explain the differences between the operation of creating a new process and that of creating a new thread. [5 marks]
 - b. Consider a system that is using 10 multilevel feedback queues for scheduling user processes (numbered from 0, highest priority, to 9, lowest priority). Consider three processes, A, B and C that start on level 2, 4 and 7 respectively and have the execution time 0.2 s, 1 s and 2 s respectively. If the time slice for level 0, denoted by q , is 10 ms, show the execution of these three processes on the time axis and determine when they exit the system. We assume there is no I/O operation. The execution time slice for each level i is $2^i q$. [10 marks]
 - c. Explain the impact of I/O operations on the priority of processes for processes A, B and C in 1.b. As an example, consider that process B will run for 450 ms after which it will start disk operations that will take 2 s. [5 marks]
 - d. Define the concept of domain scheduling. Explain the policy parameters that are used for different levels in the domain hierarchy. [5 marks]
2. Virtual memory allows programmers to ignore the physical limitations of computer system memory. The page is the main memory allocation unit.
 - a. Explain the purpose of a page table and all the fields of a page entry. [5 marks]
 - b. Discuss the main memory management functions (free space, allocation, replacement), using an example of function implementation for each of them. [10 marks]
 - c. Present the concept of working set of pages allocation to a process and some aspects of implementation by a Windows system. [5 marks]

3. The file system is a complex part of operating systems that includes a lot of services.
- a. Discuss the file system services. How does the exclusive file access algorithm work ?
[5 marks]
 - b. Present different file system directory models, discussing the benefits of using each model.
[5 marks]
 - c. Disk scheduling optimises the access time and the disk bandwidth. Define these two performance metrics and explain SCAN and then C-SCAN scheduling using an example.
[10 marks]
 - d. Analyse the factors that can improve the I/O scheduling results.
[5 marks]
4. RAID is a recent addition to computer systems that increases both the storage space and its reliability.
- a. Explain the concept of RAID and how the access time is faster.
[5 marks]
 - b. Compare RAID level 1 with RAID level 2.
[5 marks]