581331 Operating Systems I

Please write on each paper the date and the name of the course as well as your name, student id (or social security number) and signature. *Try to keep your answers short.*

1. THREE OF EACH (12 p)

   a) List three cases where the functionality of the hardware or the OS is based on the principle of locality. Appr. one sentence for each to explain the most essential points.

   b) List three hardware level features that are necessary when implementing multiprogramming hardware. One sentence for each to explain the main reasons for the necessity.

   c) List three <u>different kind</u>s of situations that cause the CPU to run interrupt handler. Use one sentence for each case to explain how the OS handles the situation

   d) List three techniques for performing I/O. One sentence for each to describe the main difference from the others.

2. MEMORY MANAGEMENT (18 p)

   a) Please explain in details, what are the components of the Memory Management Unit (MMU) and how does it do address translations, when the system is based on paging virtual memory. Where does it find the needed pieces of information? (12p)

   b) What changes in your explanation of a)-part, if the system uses Two-Level Paging System? (3p)

   c) What is the physical memory location, when the logical memory address is   (3p)
   .

      a. 0001100101010101

      b. 0011001010101010

      c. 0000110000111100

Page table

Page #	Frame #
000011	001110
000110	110001
001100	--

3. SECONDARY STORAGE MANAGEMENT (6 p)

   Explain two approaches to keep track of the free blocks available to allocation on a disk. Give the pros and cons for each alternative.

**COURSE FEEDBACK: Please give us feedback using the department's feedback form https://ilmo.cs.helsinki.fi/kurssit/servlet/Valinta?kieli=en**

Name_____   Student id:_____

4. CORRECT OR FALSE (12 p)

Each right choice will give you 0.5 points and each wrong choice -0.5 p, empty answer will give 0 p. You can answer here or copy your answers to another paper.

Correct False

☐ ☐ 1. Translation lookaside buffer contains physical memory addresses.

☐ ☐ 2. The file pointer is stored in file table.

☐ ☐ 3. Process control block contains the page table pointer.

☐ ☐ 4. Buddy System is used to organise the processes in the READY queue.

☐ ☐ 5. Each process has its own stack.

☐ ☐ 6. Each thread has its own stack.

☐ ☐ 7. Best Fit creates smaller external memory fragments than First Fit.

☐ ☐ 8. In segmentation, the physical memory addresses are formed using catenation.

☐ ☐ 9. Page table entries may contain page table pointers.

☐ ☐ 10. Process may continue its execution immediately after the event it has been .
        waiting for happens.

☐ ☐ 11. Device driver sets the bit in the program status word when interrupt is requested.

☐ ☐ 12. Process control block contains information about the process owner.

☐ ☐ 13. Operating system can at any moment change the process that is currently
        executing on the processor.

☐ ☐ 14. Program counter is kept in process control block.

☐ ☐ 15. Program status word is kept in file table.

☐ ☐ 16. Main memory is approximately one thousand times faster than disk memory.

☐ ☐ 17. Main memory is approximately one billion times faster than disk memory.

☐ ☐ 18. Shared use requires re-entrancy from the program code.

☐ ☐ 19. Interrupt handler decides the next process that will be executed.

☐ ☐ 20. Process that is swapped out cannot be executed.

☐ ☐ 21. Device driver is part of the operating system.

☐ ☐ 22. File table contains information about all files in the file system.

☐ ☐ 23. Paging causes external fragmentation.

☐ ☐ 24. In segmentation, the whole process must be in memory during execution.
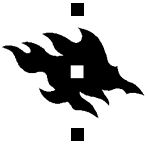
HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

581331 Operating System I

Tiina Niklander

Course Exam
1(2)
18.10.2005