

OHJ-4106 Operating Systems

Exam 10.9.2007

Calculators, computers or literature are NOT allowed in this exam.

1. Describe shortly (as to someone not familiar with this particular software systems subject) what these concepts are: (2 p/item):
 - a) What are the main functions of an operating system?
 - b) Context switch
 - c) Privileged instruction
 - d) Swapping
 - e) Memory protection
 - f) Virtual memory

2. Evaluate a system which contains only one external device: a disk. Program execution in this system contains steps: wait to use CPU, use CPU, wait to use Disk, use Disk. In this system we consider a workload, which consist of two programs: A and B. A step “use Disk” length for both programs is always (for simplicity) 30 ms. Program A step “use CPU” length is always 40 ms. For program B this step length is 10 ms. Program A execution contains steps: CPU, disk, CPU, disk, CPU. For program B the steps are: CPU, disk, CPU, disk, CPU, disk, CPU, disk, CPU. Compare the following scheduling methods in executing this workload. Use variables CPU utilization degree (utilization degree = device worktime divided by total time under analysis), workload turnaround time (time from system start to when last program finishes execution) and average turnaround time (turnaround time = time from program start to when it finishes execution) in the comparison. Your answer must contain details how the variables are calculated. (6 p)
 - FIFO scheduling (program A starts in CPU)
 - pre-emptive fixed priority (program B has greater priority)
 - round-robin scheduling (time slice is 5 ms)

3. You are given a task to design as small as possible multiprocessing kernel. What properties (and data structures) this kernel needs at least? Give an argument why? (6 p/item)