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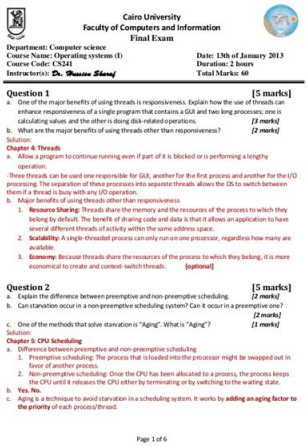

Cairo University
Faculty of Computers and Information
Final Exam

Department: Computer science
Course Name: Operating systems (I)
Course Code: CS241
Instructor(s): Dr. Shaimaa Elsaraf

Date: 13th of January 2013
Duration: 2 hours
Total Marks: 60

Question 1 [5 marks]

a. One of the major benefits of using threads is responsiveness. Explain how the use of threads can enhance responsiveness of a single program that contains a GUI and two long processes; one is calculating values and the other is doing disk-related operations. *[3 marks]*

b. What are the major benefits of using threads other than responsiveness? *[2 marks]*

Solution:

Chapter 4: Threads

a. Allow a program to continue running even if part of it is blocked or is performing a lengthy operation.

-Three threads can be used one responsible for GUI, another for the first process and another for the I/O processing. The separation of these processes into separate threads allows the OS to switch between them if a thread is busy with any I/O operation.

b. Major benefits of using threads other than responsiveness

1. **Resource Sharing:** Threads share the memory and the resources of the process to which they belong by default. The benefit of sharing code and data is that it allows an application to have several different threads of activity within the same address space.
2. **Scalability:** A single-threaded process can only run on one processor, regardless how many are available.
3. **Economy:** Because threads share the resources of the process to which they belong, it is more economical to create and context-switch threads. **[optional]**

Question 2 [5 marks]

a. Explain the difference between preemptive and non-preemptive scheduling. *[2 marks]*

b. Can starvation occur in a non-preemptive scheduling system? Can it occur in a preemptive one? *[2 marks]*

c. One of the methods that solve starvation is "Aging". What is "Aging"? *[1 marks]*

Solution:

Chapter 5: CPU Scheduling

a. Difference between preemptive and non-preemptive scheduling

1. Preemptive scheduling: The process that is loaded into the processor might be swapped out in favor of another process.
2. Non-preemptive scheduling: Once the CPU has been allocated to a process, the process keeps the CPU until it releases the CPU either by terminating or by switching to the waiting state.

b. **Yes. No.**

c. Aging is a technique to avoid starvation in a scheduling system. It works by **adding an aging factor to the priority** of each process/thread.

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