Institut for Matematik og Datalogi
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September 10, 2009

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Introduction to Computer Science
E09 – Week 3

Lecture: Monday, September 7

Rolf Fagerberg covered Sections 1.5–1.7. Peter Schneider-Kamp continued with Chapter 2 and covered Sections 2.1–2.4. In particular, Peter introduced the simple machine model (cf. Appendix C) used in Tuesday's lab session.

Lecture: Thursday, September 10

Daniel Merkle lectured on operating systems. He covered Sections 3.1–3.3.

Lecture: Monday, September 14, 12-14 (U20)

Daniel Merkle will continue to lecture on operating systems.

Lecture: Wednesday, September 16, 14-16 (U28)

Kim Skak Larsen will lecture. He will give an introduction to databases based on Chapter 9.

Lecture: Monday, September 21, 12-14

Lene Monrad Favrholdt will lecture on algorithms based on Chapter 5.

Lecture: Wednesday, September 23, 14-16

Lene Monrad Favrholdt will lecture on algorithms based on Chapter 5.

Discussion section: September 15, 14:15-16 (U9)

Chapter Review Problems 3, 5, 8, 10, 12, 13, 15, 18, 24, 25, 26, 29, 33, 41, 43, 48 on pages 164–167.

In addition (cmp. Exercise 42 on page 167):

- Find and discuss three different possibilities to avoid a deadlock situation in the Dining Philosophers Problem.
- Can starvation of a philosopher occur, even if your solution prevents a deadlock situation? Discuss!

Discussion section: September 17, 14:15-16 (U26)

Chapter Review Problems 7, 9, 10, 12, 13, 18, 24, 25, 26, 28, 38 on pages 474–477. Social Issues 3, 6, 7, 9 on pages 479–480.

The following links are to tutorials which could help with the SQL questions:

- `http://www.geocities.com/SiliconValley/Vista/2207/sql1.html`
- `http://www.w3schools.com/SQL/default.asp`

Assignment due 14:15, September 24

Late assignments will not be accepted. Working together is not allowed. You may write this either in English or Danish. Write clearly if you do it by hand. Even better, use LaTeX.

1) Solve Problem 21 on page 165.
2) If it takes one microsecond to perform a context switch and processes use only half of their allotted 10 millisecond time slices, what percent of a CPUs time is spent performing context switches rather than executing processes?
3) Which necessary condition for deadlock is removed by each of the following.
    a) Require processes to request all required resources at once.
    b) Allow only one process at a time in the process table.

c) Take all resources from processes when deadlock occurs and restart the processes.

4) What problem could occur if an operating system is designed to use very short time slices, in order to allow more processes to share time in a multiprogramming environment?

5) Suppose we represent each process in a time-sharing system with a dot and draw an arrow from one dot to another if the process represented by the first dot is waiting for a resource being used by the second. This picture is a directed graph.

   a) What property of the directed graph is equivalent to a deadlock in the system?
   b) Draw this directed graph for a deadlock situation in the Dining Philosophers problem, where each Philosopher corresponds to a process.

6) Consider the following set of processes, with the length of the CPU burst given in milliseconds.

Process	Burst Time
P_1	10
P_2	1
P_3	2
P_4	1
P_5	5

   The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 all at time 0.

   a) Draw three Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, and RR (quantum = 1).
   b) What is the turnaround time of each process for each of the scheduling algorithms in part a?
   c) What is the waiting time of each process for each of the scheduling algorithms in part a?
   d) Which of the algorithms results in the minimum average waiting time (over all processes)?