Exercise 1 "Implementation of Databases"
Due until 29 Oct, 2008 (before exercises)  WS 08/09

Note: Please do not forget to indicate on your solution sheet your name, student ID and the program you participate in.

1.1 Terminology  (7 pt.)

Define shortly in your own words the following terms:
- Database, Database Management System, and Database System
- Physical Data Independence and Logical Data Independence
- Block and Page
- Asynchronous I/O, Blocking I/O, and Block I/O
- Access Path
- Query
- Transaction

1.2 Buffer Management  (6 pt.)

Disk access is magnitudes slower than memory access, which makes it the common bottleneck for database applications. However, utilizing buffer pools can alleviate this problem, with asynchronous I/O, prefetch and growing size of available memory. For instance, writing to disk can be totally absorbed by using buffer.

1. Modern operating systems all possess the ability to do buffering. But almost all DBMS's implement their own buffering. Give a reason why it is good to let DBMS in charge of these tasks.

2. While all I/O's go through a buffer, long processing threads usually copy their own pages out of the buffer pool. Explain the benefits.

3. If the average I/O consuming rate of DBMS is much larger than disk reading rate, buffering cannot help much. What would you do in such case?

1.3 Database Architecture  (7 pt.)

1. Name each of the five layers in the database architecture specified in the lecture, explain the concepts handled in each layer, and the interfaces between layers.

2. The following tasks belong to different layers; sort them so that they match the architecture top-down.
   (a) buffering
   (b) logical relation and cursor management
   (c) media access
   (d) access path management
   (e) view formulation and management

3. Why is the architecture not fully implemented in DBMS?