**Quiz Sheet No. 1 for *Architecture and Implementation of Database Systems***
Prof. Rudolf Bayer, Ph. D.
Institut für Informatik
SS 2003

Exercises for **Chapter 1: File System**

1. What must be the block size on a hard drive so that the net output (Nutzleistung) for accessing the hard drive reaches 50%? (Chose for yourself the technical parameters of the hard drive from a recent source.)

2. Determine the general formula for the net output in B/s of a hard drive dependent on the average access time α in ms and the transfer rate β in B/s.

3. UNIX files:
   a) What is the maximum size of a UNIX file if the block size is 4 KB?
   b) What is the maximally *addressable* size of a UNIX file using byte addressing
      – in 32 bit computers using 31 bits per address, and
      – in 64 bit computers using 63 bits?
   c) What block size must be chosen for a UNIX file in order to achieve the maximum addressability for both addressing schemes?

4. How may a relation of size 60 GB be mapped on a UNIX file system? Suggest an appropriate tuple identifier.

Exercises for **Chapter 2: B-Trees**

1. How many values can be stored in a B-Tree of order n and depth m, maximally and minimally?

2. Let T be a B-Tree of order 2 and let S = (90, 85, 25, 16, 20, 15, 70, 22, 12, 10, 5, 1) be a sequence of integers that are inserted in this order into T. Sketch the different stages of T in this process.

3. Let T be a B-Tree of this form:
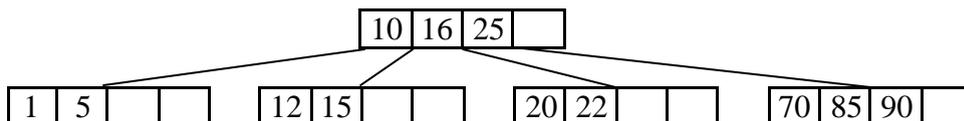
   a) Sketch the different stages of the tree when deleting entries 85,12 and 16 (in this order).
   b) How does T change if value 16 is now inserted again?