Datenbanken II (SS 2018)
Exercise 3

Task 1 Which different storage types are used in the storage hierarchy of DBMSs? Which differences exist between the different storage types? Why is the usage of different storage types in one DBMS possible/reasonable?

Task 2 Which advantages and disadvantages do hard-disks and flash storage provide? Discuss the operating principles of both storage media based on the following operations:

- Sequential read
- Read of blocks (Random-Access)
- Read of bits (Random-Access)
- Sequential write
- Write of blocks (Random-Access)
- Write of bits (Random-Access)

How can flash-storage be considered within the memory architecture?

Task 3 Raid

(a) Which RAID-Levels (Raid0-6) are suitable to ensure the following requirements of DBMSs:
- Persistence
- Access speed
- Throughput

Which disadvantages do Raid systems have?

(b) On a RAID-3 system with 5 disks the following records are stored:
1. Platte: D1 = 10100101
2. Platte: D2 = 11110000
3. Platte: D3 = 00111100
4. Platte: D4 = 10111001

Explain a procedure for the computation of the parity bit P = ??????? ! Assume, that disk No. 3 is defective. How can D3 be computed from the remaining information?
Task 4 Which aspects must be considered regarding the long-term archiving?

Task 5 How is the storage managed within a DBMS? Why does a DBMS use an own storage management instead of files and blocks of an operating system?

Task 6 Assigning Records to Pages

In an exemplary DBMS, tuples are stored on pages with a size of 100 Byte.

(a) For the management of meetings with other people, a student uses a DBMS (characterized above). The following table structure is used:

- **Name**: varchar(10)
- **Date**: char(10)
- **Time**: char(5)
- **Venue**: varchar(15)
- **Activity**: varchar(15)
- **Bring along**: varchar(10)

Describe two possible ways to represent a record of this type on a page of a DBMS. Is a record always stored exactly on one page?

(b)

Simulate stepwise the insertion of data from the following table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Time</th>
<th>Venue</th>
<th>Activity</th>
<th>Bring along</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kai</td>
<td>16.06.2008</td>
<td>11:00</td>
<td>Layla</td>
<td>Brunch</td>
<td>nichts</td>
</tr>
<tr>
<td>Jana</td>
<td>30.07.2008</td>
<td>15:00</td>
<td>Stadtpark</td>
<td>Skaten</td>
<td>Skates</td>
</tr>
<tr>
<td>Nicole</td>
<td>11.08.2008</td>
<td>18:30</td>
<td>Springbrunnen</td>
<td>Kaffetrinken</td>
<td>Rosen</td>
</tr>
</tbody>
</table>

The following meta information need to be considered:

- Page number
- Previous page
- Succeeding page
- Tuple-Offset
- Tuple-Length
- Attribute-Count
- Attribute-Length

Each meta information needs 1 Bytes to be stored.

(c) Simulate the following updates:

- Last-minute the student detects an embarrassing fault? Skating is not with Jana but with Markus!
- Furthermore, Markus selects a different venue: Einkaufszentrum.

**Good Luck!**