Exercises for *Transaction Systems*, summer term 2016
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http://www-db.in.tum.de/teaching/ss16/transactions/

Sheet No. 9

Info
- Due date: Friday, June 24, 3pm.
- Please send your solution via e-mail, and prefix the subject with `[transactions]`.
- Please include your Matrikelnummer and your name.
- Please submit a PDF.

Exercise 1 (7 points) In a semi-queue, enqueuing works like in a usual queue, but dequeuing non-deterministically selects and removes an arbitrary entry from the queue. Construct the return value commutativity table for a semi-queue. Show (by example) that semi-queues allow higher concurrency than usual queues.

Exercise 2 (6 points) Consider the following execution of operations on an initially empty queue $q$, where $a$, $b$, and $c$ are added:

```
(enq₁(q; a)) (enq₂(q; b)) (deq₃(q)) (enq₁(q; c)) (deq₃(q))
```

For each of the following assumptions, state whether the execution is serializable, and give a short explanation (i.e., one sentence):

(a) general commutativity
(b) return value commutativity for queues
(c) return value commutativity for semi-queues

Exercise 3 (12 points) Apply the following hybrid protocols to the schedule found on slide 8 of chapter 7 in a selective way, such that only two levels are involved:

- forward-oriented optimistic concurrency control (FOCC) at the page level and strong 2PL at the record level
- FOCC at the page level, strong 2PL at the query level
- ROMV at the page level, strong 2PL at the record level
- ROMV at the page level, strong 2PL at the query level