The third exam is focused the topics discussed in class since the second exam. It will be closed book and closed notes and will focus on the lecture notes, class discussions, and homework assignments – you should use the textbook for clarification of concepts and their significance, but material from the text that was not covered in class will not be on the exam.

The exam will be worth 100 points, and will be a combination of Matching, True/False, and multiple choice questions.

**Parameterized queries**
- Definition / justification / explanation / advantages
- Calling parameterized queries externally
- SQL Injection

**Stored procedures and triggers**
- Definition / justification / explanation / advantages
- Stored procedures in MySQL
- Persistent stored modules
- Triggers

**Database transactions:**
- Definition / justification / explanation
- Successful transaction
- Consistent database state
- Properties of a transaction
- Transaction management
  - COMMIT
  - ROLLBACK
- Transaction log
- Multi-step transactions in MS Access

**Database concurrency control**
- Definition / justification / explanation
- Interleaving of operations
- Potential problems caused by concurrency
  - Be able to explain
- Scheduler
- Serializable schedule
- Locking methods
- Lock granularity
- Exclusive lock
- Shared lock
- Optimistic locking
- Pessimistic locking
- Two-phase locking
- Deadlocks / controlling deadlocks
- Timestamping

**Business Intelligence and data warehousing**
- Definition / justification / explanation
- Typical major components
Operational data vs. decision support data
General steps of BI
Data warehouse
Nonvolatile data
Data mart
Online Analytical Processing (OLAP)
Multi-dimensional DBMS
Data cube
Star schema

**Data mining**
Definition
Motivation
Types of algorithms (Supervised vs. Unsupervised)
Classification
  k-Nearest Neighbor
  Neural networks
Clustering

**Big Data and NoSQL**
Changing types of data
Impacts of big data on traditional BI databases
Differences between SQL and NoSQL
  Tables
  Schemas
  Normalization
  JOINs
  Data integrity
  Transactions
  Performance
  Scaling
JSON