# TÖL303G
# Gagnasafnsfræði
# Vikublað 13

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17. nóvember 2022

## Efnisyfirlit



# 1 Efni vikunnar — The Weeks Material

Við höfum klárað efni námskeiðsins og förum nú í yfirlit efnis, upprifjun og undirbúning lokaprófs. Þetta er síðasta vikublað námskeiðsins.

We have exhausted the material of the course and will commence reviewing and preparing for the final exam. This is the last weekly of the course.

# 2 Verkefni — Assignments

## 2.1 Gradiance verkefni — Gradiance Assignments

Finnið Gradiance verkefni á venjulegum stað, verkefni vikunnar heita „Verkefni 13“.

Find the Gradiance assignment at the usual place, the weeks assignment is named "Verkefni 13".

## 2.2 Gradescope verkefni — Gradescope Assignments

Gradescope verkefnið er að þessu sinni hópverkefni í stað þess að vera einstaklingsverkefni. Leysið dæmi 4, 5 og 6 í lokaprófinu frá haustinu 2017. Í prófasafninu í Uglunni heitir þetta próf `TÖL303G_H17.pdf`. Takið eftir að skilafresturinn fyrir þetta verkefni er til miðnættis föstudaginn með síðasta fyrirlestur misserisins.

The Gradescope assignment is in this case a group assignment instead of being an individual assignment. Answer questions 4, 5, and 6 in the final exam from the autumn of 2017. In the exam collection in Ugla this is `TÖL303G_H17.pdf`. Note that the deadline for this assignment is at midnight on the Friday with the last lecture of the term.

# 3 Lokapróf — Final Exam

Fyrirlestrar þessa viku og næstu fara í upprifjun fyrir lokaprófið.

Lokaprófið verður án hjálpargagna. Prófið verður keimlíkt miðannarprófinu, en viðameira.

**Þið megið búast við því að langflest verkefnin í prófinu verði mjög svipuð verkefnum misserisins og úr miðannarprófinu.**

Í prófinu verða SQL málrit (fyrir SQLite) svo þið þurfið ekki að leggja þau smáatriði á minnið. Málritin eru aftar í þessu skjali, til hliðsjónar.

Einnig verður í prófinu einfalt Java JDBC dæmi, sem einnig er aftar í þessu skjali.

Í prófinu verða einnig skilgreiningar á 3NF og BCNF, eins og sýnt er aftar í þessu skjali.

The lectures this week and the next will be spent reviewing and preparing for the final exam.

Help materials will not be allowed in the final exam. The exam will be similar to the midterm exam, but more extensive.

**You may expect that most questions in the exam will be similar to assignments or questions in the midterm exam.**

The exam will contain SQL syntax diagrams (for SQLite) so you do not have to memorize those details. The syntax diagrams are below in this document, for reference.

Also the exam will contain a simple Java JDBC example, also shown below in this document.

The exam will contain definitions of 3NF and BCNF, as shown below in this document.

# 4 Helstu atriði — Highlights

## 4.1 Íslenska

Mælt er með að þið leggið megináherslu á að rifja upp eftirfarandi (u.þ.b. allt sem rætt hefur verið um):

- Grundvallarhugmyndin og grundvallarhugtök tengd venslagagnagrunnum svo sem vensl, töflur, eigindi, dálkar, n-dir, skorður, lyklar, þ.m.t. yfirlyklar, mögulegir lyklar, aðallyklar, o.s.frv.
- SQL, einkum SELECT og allar flækjurnar þar, en einnig t.d. CREATE TABLE og aðallyklar og ytri lyklar í töflum.
- Þið ættuð að geta lesið, skilið og skrifað fyrirspurnir fyrir einföld og ekki-svo-einföld vandamál bæði í SQL (SELECT) og í venslaalgebru.
- Fallákveður (*functional dependencies*), lokanir þeirra (*closure*), lágþekja (lággrunnur, *minimal cover*, *minimal basis*) safns fallákveða og notkun fallákveða í gagnagrunnshönnun.
- Uppfærslufrávik (*update anomalies*), staðalskipulög (*normal form*), taplausar tengingar (*lossless join*) og prófun þeirra, viðhald fallákveða í venslaþáttun, venslaþáttun og hönnun venslasafna (hönnun gagnagrunna) í 3NF og BCNF.
- Hvað eru ESQL, SQL/CLI (ODBC) og JDBC. Notkun SQL í Java með JDBC.
- Ágæðun (*optimization*) fyrirspurna. Fyrirspurnaáætlanir.
- Einindavenslalíkön. Þurfið að skilja einindavenslalíkön og geta búið til venslagagnagrunn (t.d. CREATE TABLE skipanir) út frá einindavenslalíkani.
- Stýring heimilda í SQL, heimildanet.

- Þriggja laga högun og kostir hennar. Áhrif högunar á svartíma.

Trúlega er besta upprifjunaraðferðin að leysa aftur verkefni í Gradescope, Gradiance og í miðmisserisprófinu.

## 4.2 English

I recommend you emphasize reviewing the following (just about everything covered):

- Basic ideas and terms regarding relational databases such as relations, tables, attributes, columns, tuples, constraints, keys including superkeys, candidate keys, primary keys, etc.
- SQL, especially SELECT and all its complications, but also CREATE TABLE and primary keys and foreign keys in tables.
- You should be capable of reading, understanding, and writing queries for simple and not-so-simple problems both in SQL (SELECT) and in relational algebra.
- Functional dependencies (FD's), their closures, minimal cover (minimal basis) of a collection of FD's, and the general use of FD's in database design.
- Update anomalies, normal forms, lossless joins and their testing, preserving FD's in decompositions of relations, decompositions and database design into 3NF and BCNF.
- What are ESQL, SQL/CLI (ODBC), and JDBC. Using SQL in Java with JDBC.
- Query optimization. Query plans.
- Entity-relationship (E/R) models. You need to understand E/R models and be able to make a relational database (e.g. CREATE TABLE commands) based on an E/R model.
- Controlling authorizations in SQL, grant diagrams.
- Three tier architecture and its advantages. The effects of architecture on response time.

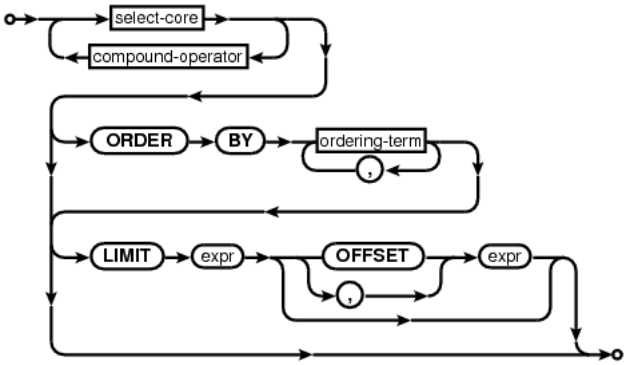
Likely the best review method is to solve again assignments in Gradescope, Gradiance and on the midterm.

# 5 Einfalt Java dæmi — Simple Java Example

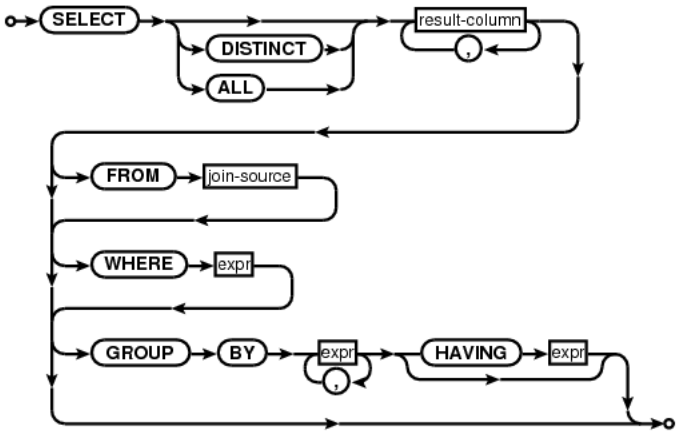
```
public class SqlExample
{
  static final String url = "...";
  public static void main( String[] args )
    throws Exception
  {
    Class.forName("...");
    java.sql.Connection conn =
      java.sql.DriverManager.getConnection(url);
    java.sql.Statement stmt = conn.createStatement();
    stmt.executeUpdate("create table t(x integer)");
    java.sql.PreparedStatement pstmt =
      conn.prepareStatement("drop table t");
    java.sql.ResultSet rs = stmt.executeQuery("select * from u");
    while( rs.next() )
    {
      System.out.println(rs.getString(1));
    }
    rs.close();
    pstmt = conn.prepareStatement("insert into u values(?)");
    pstmt.setString(1,"new string value");
    pstmt.executeUpdate();
    pstmt = conn.prepareStatement("select * from u");
    rs = pstmt.executeQuery();
    while( rs.next() )
    {
       System.out.println(rs.getString(1));
    }
    rs.close();
    conn.close();
  }
}
```

# 6 SQLite málrit — SQLite Syntax Diagrams

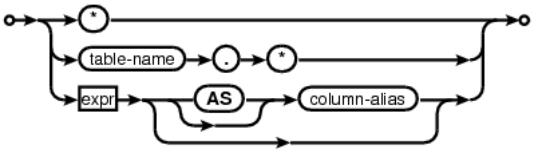
**select-stmt:**




**select-core:**

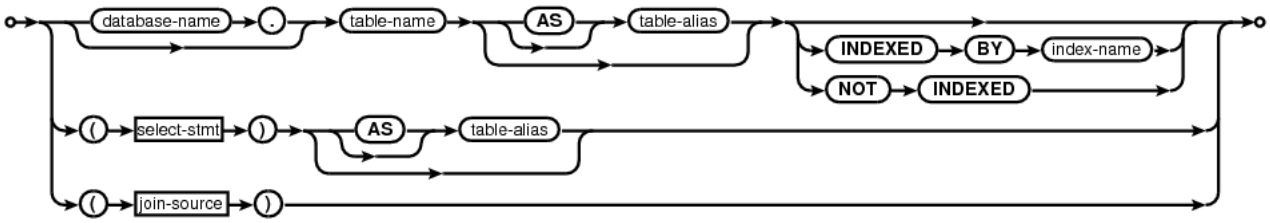



**result-column:**

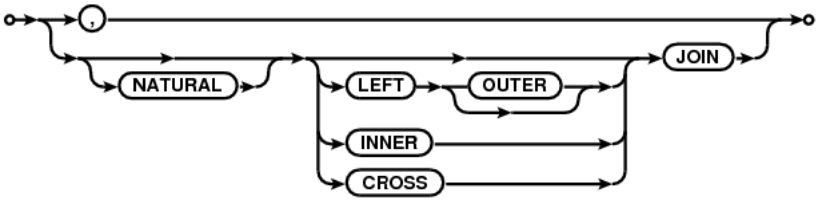



**join-source:**

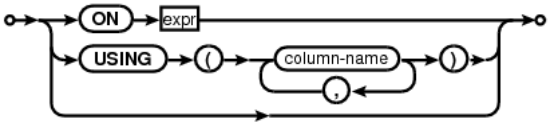
**single-source:**



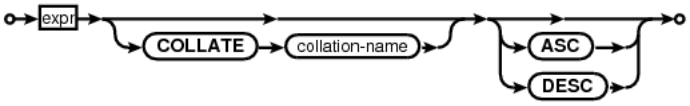

**join-op:**



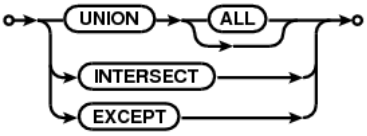

**join-constraint:**



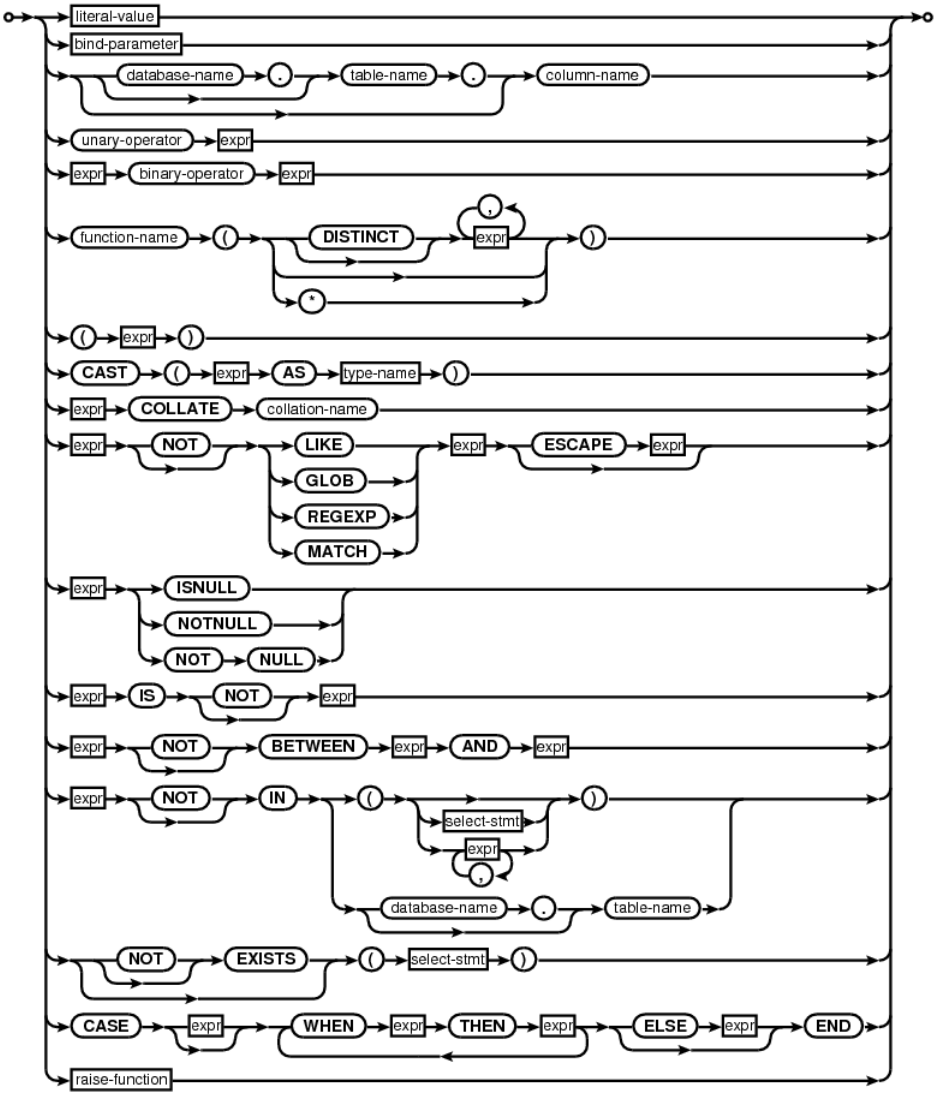

**ordering-term:**



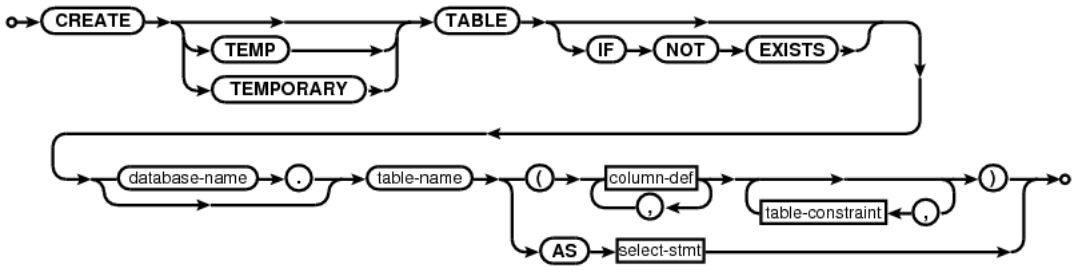

**compound-operator:**



**expr:**

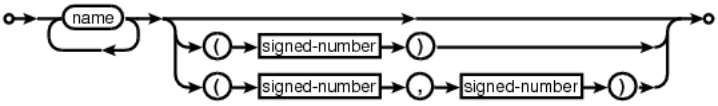



**create-table-stmt:**

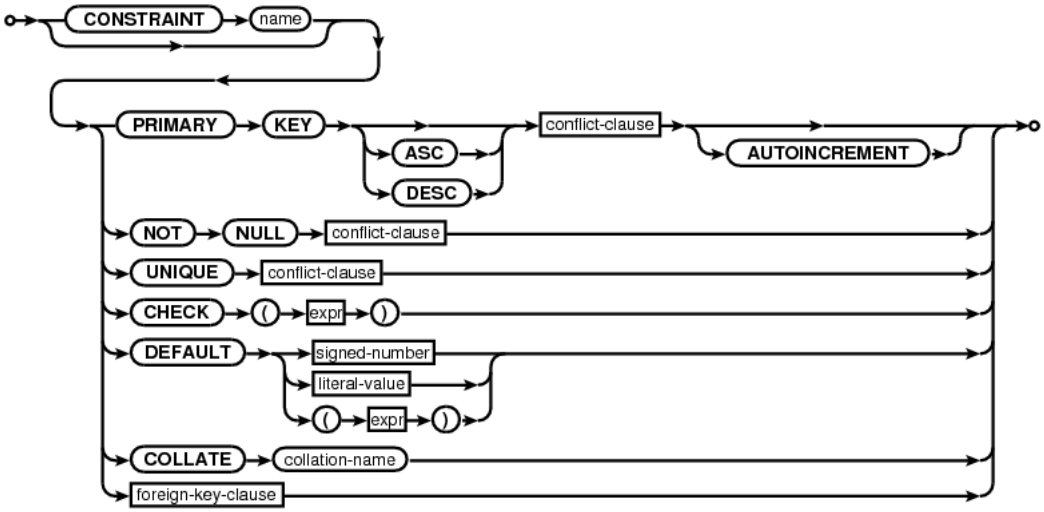


**column-def:**


**type-name:**




**column-constraint:**




**signed-number:**

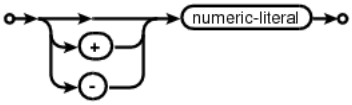
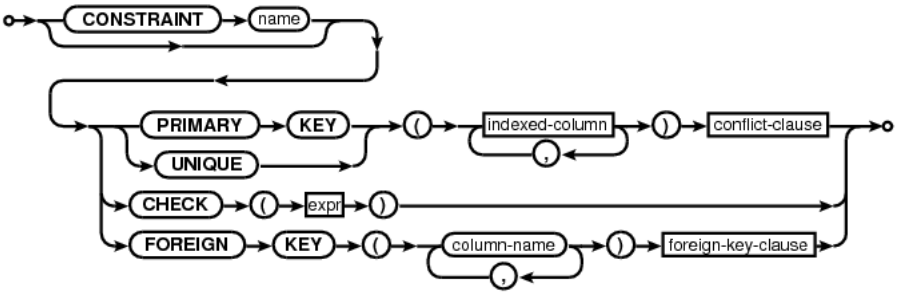
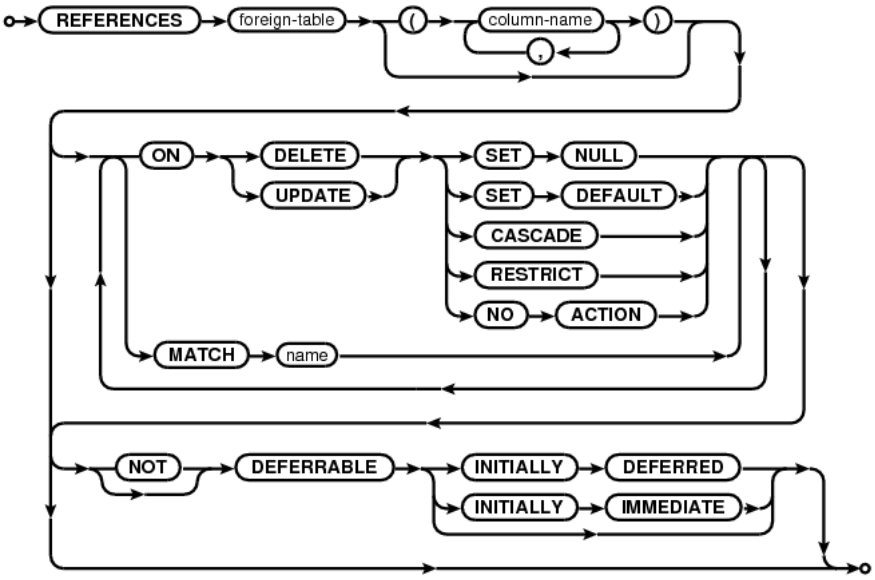


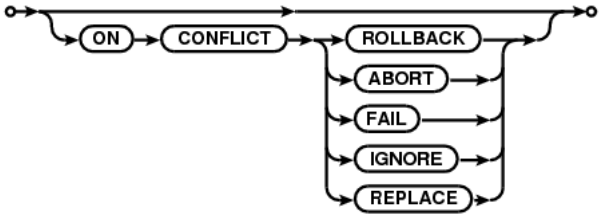

**table-constraint:**



**foreign-key-clause:**




**conflict-clause:**




# 7 Staðalskipulög — Normal Forms

**BCNF** Venslasafn er í BCNF ef fyrir allar ófáfengilegar (*nontrivial*) fallákveður $X \to A$ innan vensla $R$ í safninu gildir að $X$ er yfirlykill $R$

A collection of relations is in BCNF if for all nontrivial FD's $X \to A$ within a relation $R$ in the collection $X$ is a superkey of $R$.

**3NF** Venslasafn er í 3NF ef fyrir allar ófáfengilegar (*nontrivial*) fallákveður $X \to A$ innan vensla $R$ í safninu gildir **annað hvort** að $X$ er yfirlykill $R$ **eða** að öll eigindi í $A - X$ eru hluti einhvers mögulegs lykils fyrir $R$.

A collection of relations is in 3NF if for all nontrivial FD's $X \to A$ within a relation $R$ in the collection $X$ is a superkey of $R$ **or** all attributes in $A - X$ are part of some candidate key for $R$.