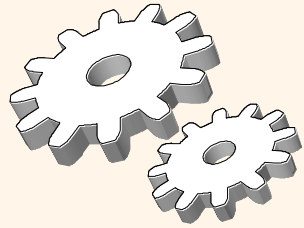
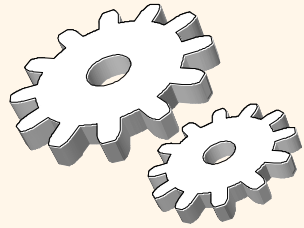


COMP7640
Database Systems & Administration

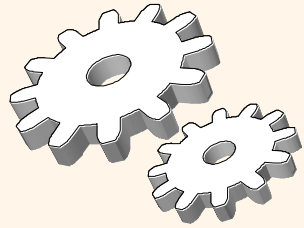
Course Review & Key Points
for the Final Exam

Examination Topics

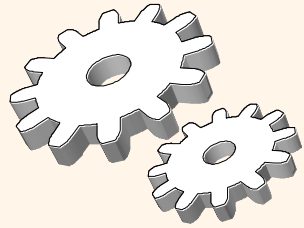


- Lec. 1 & 2: ER Model
- Lec. 2 & 3: Relational Model
- Lec. 4 & 5: SQL & Advanced SQL
- Lec. 6: Decomposition & FD

Examination Topics



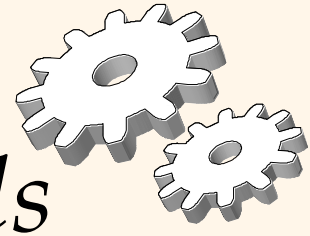
- Lec. 7: Data Storage & Access Methods
- Lec. 8: Tree-structured Indexing
- Lec. 9: Hash-based Indexing
- Lec. 10: Query Evaluation
- Lec. 11: Query Optimization
- Lec. 12: Transactions & Concurrency Control
- Lec. 13: Crash Recovery



Lectures 1 & 2: ER Model

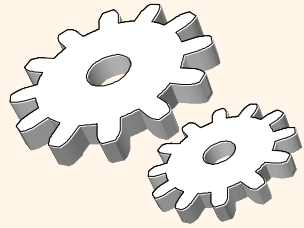
- Entity set, Attributes, Key
- Relationship set
- Constraints on relationship sets
  - one-to-one (1-1)
  - one-to-many (1-m)
  - many-to-one (m-1)
  - many-to-many (m-m)

Lectures 2 & 3: Relational Models



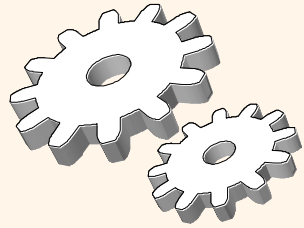
- Schema, Instance
- Basic SQL for creating tables, inserting and deleting tuples
- Integrity constraints
- Mapping ER models to relational models
  - cardinality constraints
  - participation constraints

Lectures 4 & 5: SQL



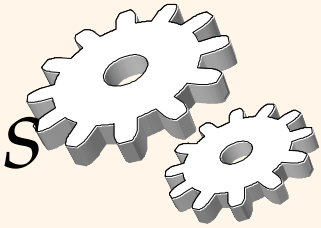
- Basic SQL for selection
  - WHERE, AND/OR, ORDER BY, JOIN
  - INTERSECT, UNION, EXCEPT
- Advanced SQL
  - Aggregation function
  - Nested query
  - All/Some
  - Exists/ Not Exists
  - In/ Not in

Lecture 6: Decomposition & FD



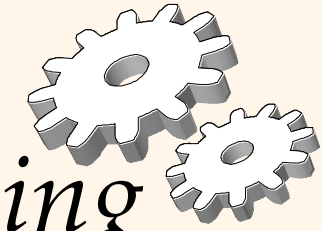
- Legal/Illegal decomposition
- Functional dependency rules
  - A Candidate Key Determines All
  - Reflexivity
  - Union (Combining)
  - Transitivity
  - Augmentation
  - Splitting
- Prove & Disprove
  - Prove an FD with the rules
  - Disprove an FD with counterexamples.

Lecture 7: Data Storage & Access Methods



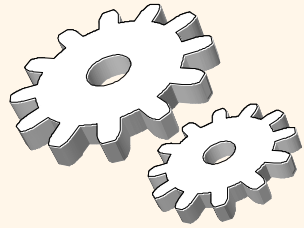
- Components of a Disk
- Strategies for arranging pages on disks
  - Store records randomly
  - Store records by "next"
- File organizations
  - Heap files, sorted files, and hashed files
- Indexes and data entries

Lecture 8: Tree-structured Indexing

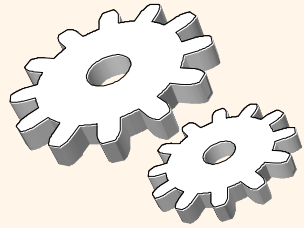


- ISAM
  - Index structure
  - Search I/O Cost
    - excluding reading records and assuming no overflow pages
- B+ tree
  - Index structure
  - Draw updated B+ trees
    - How to deal with insertions, particularly overflow
    - How to deal with deletions, particularly underflow

Lecture 9: Hash-based Indexing



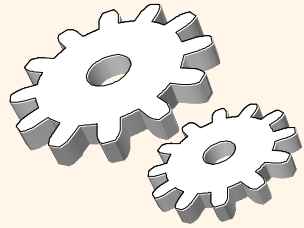
- Basics
  - Hash functions
  - Binary formats of numbers
- Extendible hashing
  - Index structure: buckets, directory
  - How to search
  - Draw updated extendible hashing index
    - How to deal with insertions
    - How to deal with deletions



Lecture 10: Query Evaluation

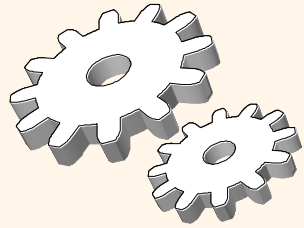
- Access Paths for Selection
  - Scan, B+ tree, Hash index
  - I/O cost analysis
- Access Paths for Join
  - Simple Nested Loops Join
    - How to achieve smaller I/O cost
  - Page-oriented Nested Loops Join
    - How to achieve smaller I/O cost
  - I/O cost analysis

Lecture 11: Query Optimization



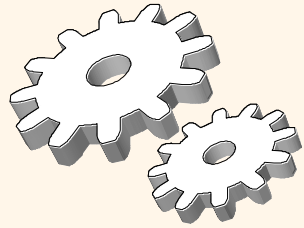
- Rules for deriving equivalent relational algebra expressions
  - Selection: decomposition & commutative rules
  - Projection: omission rule
  - Selection & Projection: commutative rule
  - Selection & Join: distributive rules 1 & 2
- Drawing QEPs
  - Relational algebra trees
  - Access paths

Lecture 12: Transactions & Concurrency Control



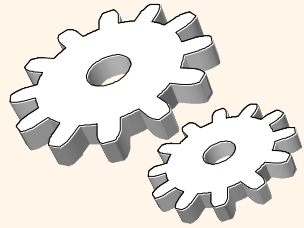
- ACID properties
- 2PL protocol
- Deadlock prevention
  - Wait-die approach
  - Wound-wait approach

Lecture 13: Crash Recovery



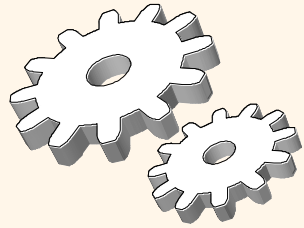
- Deferred-Modification Recovery Method
- Immediate-Modification Recovery Method

Tips



- Exam:
  - Time: 19:00 – 22:00 May 08, 2025
  - Venue: SHSH (Dr. Stephen Hui Sports Hall)
  - 10 Questions
- Sample questions
  - In-class questions
  - Assignment questions
- Better to use a pencil
- Bring your calculator

Good Luck!



- Do the CFQ:
  - https://cfq-student.hkbu.edu.hk/

Section 00001

Section 00002

- Contact
  - Email: renchi@comp.hkbu.edu.hk
  - Office: DLB 644