

**CZ2007 INTRODUCTION TO DATABASE SYSTEMS**

**LAB 3 ASSIGNMENT**

Generalization of Normalized Database Schema  
 (GROUP 4)

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All Relations, FDs and Keys are crafted based on **our group’s Lab 1 Submission**. Attached at the back is a copy of our ER Diagram.

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| **Person Relation** | |
| Attributes | Person\_ID  Name  Address  Email  Zipcode  City\_Name  State\_Name |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Name, Address, Email, Zipcode, City\_Name, State\_Name  02: Address -> Zipcode, City\_Name, State\_Name |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 does **not contain** a key of the relation 2. The attributes on the right hand side are **not contained** in the left hand side 3. The attributes on the right hand side are **not contained** in a key of the relation  * **FD 02 is NOT OK**   **The relation is not in 3NF.** | |
| **Person\_Normalized Relation** | |
| Attributes | Person\_ID  Name  Address  Email |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Name, Address, Email |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * FD 01 is **OK**   **The relation is in 3NF.** | |
| **Address\_Normalized Relation** | |
| Attributes | Address  City\_Name  State\_Name  Zipcode |
| Keys | {Address} |
| Primary Keys | {Address} |
| Functional Dependencies (FDs) | 01: Address -> City\_Name, State\_Name, Zipcode  02: Zipcode -> City\_Name, State\_Name |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * FD 01 is **OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 does **not contain** a key of the relation 2. The attributes on the right hand side are **not contained** in both the left hand side 3. The attributes on the right hand side are **not contained** in a key of the relation  * **FD 02 is NOT OK**   **The relation is not in 3NF.** | |
| **Address\_Second\_Normalized Relation** | |
| Attributes | Address  Zipcode |
| Keys | {Address} |
| Primary Keys | {Address} |
| Functional Dependencies (FDs) | 01: Address -> Zipcode |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF**. | |
| **Zipcode\_Normalized Relation** | |
| Attributes | Zipcode  City\_Name  State\_Name |
| Keys | {Zipcode} |
| Primary Keys | {Zipcode} |
| Functional Dependencies (FDs) | 01: Zipcode -> City\_Name, State\_Name |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * FD 01 is **OK**   **The relation is in 3NF**. | |

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| **Staff Relation** | |
| Attributes | Person\_ID  Staff\_ID  Date\_Hired  Position |
| Keys | {Person\_ID}  {Staff\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Staff\_ID, Date\_Hired, Position  02: Staff\_ID -> Person\_ID, Date\_Hired, Position |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 contains a key of the relation  * FD 02 is **OK**   **The relation is in 3NF.** | |

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| **Administrative\_Staff Relation** | |
| Attributes | Person\_ID |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF**. | |

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| **Technical\_Staff Relation** | |
| Attributes | Person\_ID  Lab\_Name  School |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Lab\_Name, School |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   **The relation is in 3NF.** | |

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| **Laboratory Relation** | |
| Attributes | School  Lab\_Name  Location |
| Keys | {School, Lab\_Name} |
| Primary Keys | {School, Lab\_Name} |
| Functional Dependencies (FDs) | 01: Lab\_Name, School -> Location |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   **The relation is in 3NF.** | |

\*Assume that the different labs in a school can have equipment with the same Equip\_ID.

\* Assume that the Equip\_Name is dependent on Model\_Number.

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| **Equipment Relation** | | |
| Attributes | School  Lab\_Name  Equip\_ID  Date\_Purchased  Model\_Number  Equip\_Name | |
| Keys | {School, Lab\_Name, Equip\_ID} | |
| Primary Keys | {School, Lab\_Name, Equip\_ID} | |
| Functional Dependencies (FDs) | 01: School, Lab\_Name, Equip\_ID -> Date\_Purchased, Model\_Number, Equip\_Name  02: Model\_Number -> Equip\_Name | |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 does **not contain** a key of the relation 2. The attributes on the right hand side are **not contained** in the left hand side 3. The attributes on the right hand side are **not contained** in a key of the relation  * **FD 02 is NOT OK**   **The relation is in not in 3NF.** | | |
| **Equipment\_Normalized Relation** | | |
| Attributes | | School  Lab\_Name  Equip\_ID  Date\_Purchased  Model\_Number |
| Keys | | {School, Lab\_Name, Equip\_ID} |
| Primary Keys | | {School, Lab\_Name, Equip\_ID} |
| Functional Dependencies (FDS): | | 01: School, Lab\_Name, Equip\_ID -> Date\_Purchased, Model\_Number |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   **The relation is in 3NF.** | | |
| **Equipment\_Model\_Normalized Relation** | | |
| Attributes | | Model\_Number  Equip\_Name |
| Keys | | {Model\_Number} |
| Primary Keys | | {Model\_Number} |
| Functional Dependencies (FDS): | | 01: Model\_Number -> Equip\_Name |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | | |

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| **Teaching\_Lab Relation** | |
| Attributes | School  Lab\_Name |
| Keys | {School, Lab\_Name} |
| Primary Keys | {School, Lab\_Name} |
| Functional Dependencies (FDs) | - |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

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| **Research\_Lab Relation** | |
| Attributes | School  Lab\_Name |
| Keys | {School, Lab\_Name} |
| Primary Keys | {School, Lab\_Name} |
| Functional Dependencies (FDs) | - |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

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| **Student Relation** | |
| Attributes | Person\_ID  Student\_ID  Admission\_Date  Major  Minor |
| Keys | {Person\_ID}  {Student\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Student\_ID, Admission\_Date, Major, Minor  02: Student\_ID -> Person\_ID, Admission\_Date, Major, Minor |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 contains a key of the relation  * **FD 02 is OK**   **The relation is in 3NF.** | |

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| **Graduate Relation** | |
| Attributes | Person\_ID *(From Student Relation)* |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF.** | |

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| **Undergraduate Relation** | |
| Attributes | Person\_ID *(From Student Relation)* |
| Keys | {Person\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF.** | |

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| **Undergraduate\_Experiment Relation** | |
| Attributes | Person\_ID *(From Undergraduate Relation)*  School  Lab\_Name  Attendance |
| Keys | {Person\_ID, School, Lab\_Name} |
| Primary Keys | {Person\_ID, School, Lab\_Name} |
| Functional Dependencies (FDs) | 01: Person\_ID, School, Lab\_Name -> Attendance |
| FD 01 is a non-trivial FD:  The left hand side of FD 01 contains a key of the relation   * **FD 01 is OK**   **The relation is in 3NF.** | |

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| **Graduate\_Lab\_Assignment Relation** | |
| Attributes | Person\_ID *(From Graduate Relation)*  School  Lab\_Name |
| Keys | {Person\_ID, School, Lab\_Name} |
| Primary Keys | {Person\_ID, School, Lab\_Name} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF.** | |

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| **Professor Relation** | |
| Attributes | Person\_ID Professor\_ID  Fields\_Of\_Expertise |
| Keys | {Person\_ID}  {Professor\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Professor\_ID, Fields\_Of\_Expertise  02: Professor\_ID -> Person\_ID, Fields\_Of\_Expertise |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 contains a key of the relation  * FD 02 is **OK**   **The relation is in 3NF.** | |

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| **Research Relation** | |
| Attributes | Research\_ID  Research\_Name |
| Keys | {Research\_ID} |
| Primary Keys | {Research\_ID} |
| Functional Dependencies (FDs) | 01: Research\_ID -> Research\_Name |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

\*As per lab manual, graduates are **supervised by at least one professor on particular research topic** means a professor should supervise a particular research topic of a graduate’s research. Assume Professor can supervise many research topics but a research topic must be supervised by one professor

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| **Research\_Topic Relation** | |
| Attributes | Research\_ID  Topic\_Name  Person\_ID *(From Professor Relation)* |
| Keys | {Research\_ID,Topic\_Name} |
| Primary Keys | {Research\_ID, Topic\_Name} |
| Functional Dependencies (FDs) | 01: Research\_ID, Topic\_Name -> Person\_ID |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation    * **FD 01 is OK**   **The relation is in 3NF.** | |

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| **Graduate\_Research Relation** | |
| Attributes | Research\_ID  Person\_ID *(From Graduate Relation)* |
| Keys | {Research\_ID,Person\_ID} |
| Primary Keys | {Research\_ID, Person\_ID} |
| Functional Dependencies (FDs) | - |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

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| **Course Relation** | |
| Attributes | Course\_ID  Course\_Name |
| Keys | {Course\_ID} |
| Primary Keys | {Course\_ID} |
| Functional Dependencies (FDs) | 01: Course\_ID -> Course\_Name |
| All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

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| **Class Relation** | |
| Attributes | Course\_ID  Class\_ID  Date\_Time  Person\_ID *(From Professor Relation)* |
| Keys | {Course\_ID, Class\_ID} |
| Primary Keys | {Course\_ID, Class\_ID} |
| Functional Dependencies (FDs) | 01: Course\_ID, Class\_ID -> Date\_Time, Person\_ID, Student\_ID |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   **The relation is in 3NF.** | |

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| **Student\_Class** | |
| Attributes | Class\_ID  Course\_ID  Person\_ID (*From Student Relation)* |
| Keys | {Class\_ID, Course\_ID, Person\_ID} |
| Primary Keys | {Class\_ID, Course\_ID,Person\_ID} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF.** | |

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| **Timetable Relation** | |
| Attributes | Timetable\_ID  Person\_ID *(From Professor Relation)* |
| Keys | {Timetable\_ID}  {Person\_ID} |
| Primary Keys | {Timetable\_ID} |
| Functional Dependencies (FDs) | 01: Timetable\_ID -> Person\_ID  02: Person\_ID -> Timetable\_ID |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * **FD 01 is OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 contains a key of the relation  * FD 02 is **OK**   All relations with only two attributes are in BCNF and thus must also be in 3NF.  **The relation is in 3NF.** | |

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| **Class\_In\_Timetable Relation** | |
| Attributes | Timetable\_ID  Class\_ID  Course\_ID  DateTime |
| Keys | {Timetable\_ID, Class\_ID, Course\_ID} |
| Primary Keys | {Timetable\_ID, Class\_ID, Course\_ID} |
| Functional Dependencies (FDs) | 01: Timetable\_ID, Class\_ID, Course\_ID → DateTime |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * FD 01 is **OK**   **The relation is in 3NF.** | |

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| **Stakeholder Relation** | |
| Attributes | Person\_ID  Stakeholder\_ID  Domain |
| Keys | {Person\_ID}  {Stakeholder\_ID} |
| Primary Keys | {Person\_ID} |
| Functional Dependencies (FDs) | 01: Person\_ID -> Stakeholder\_ID, Domain  02: Stakeholder\_ID -> Person\_ID, Domain |
| FD 01 is a non-trivial FD:   1. The left hand side of FD 01 contains a key of the relation  * FD 01 is **OK**   FD 02 is a non-trivial FD:   1. The left hand side of FD 02 contains a key of the relation  * FD 02 is **OK**   **The relation is in 3NF.** | |

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| **Comment Relation** | |
| Attributes | Person\_ID *(From Stakeholder Relation)*  Topic  Date\_Time |
| Keys | {Person\_ID, Topic, Date\_Time} |
| Primary Keys | {Person\_ID, Topic, Date\_Time} |
| Functional Dependencies (FDs) | - |
| **The relation is in 3NF.** | |

