Name

UIN

Homework Assignment 3

April 3rd, 2025
Due on April 17th, 11:59pm (midnight)

CS480 - Database Systems

Please leave this empty!

3.1 3.2 3.3

Sum

Instructions

- Try to answer all the questions using what you have learned in class
- Some questions are marked as bonus. You do not have to answer these questions to get full points for the assignment. However, you can get bonus points for these questions!

Part 3.1 Modelling (Total: 60 Points)

Question 3.1.1 (60 Points)

Build a conceptional model for a **university internship matching program**. The solution should be presented as an **ER-diagram**. Your design should implement the following requirements.

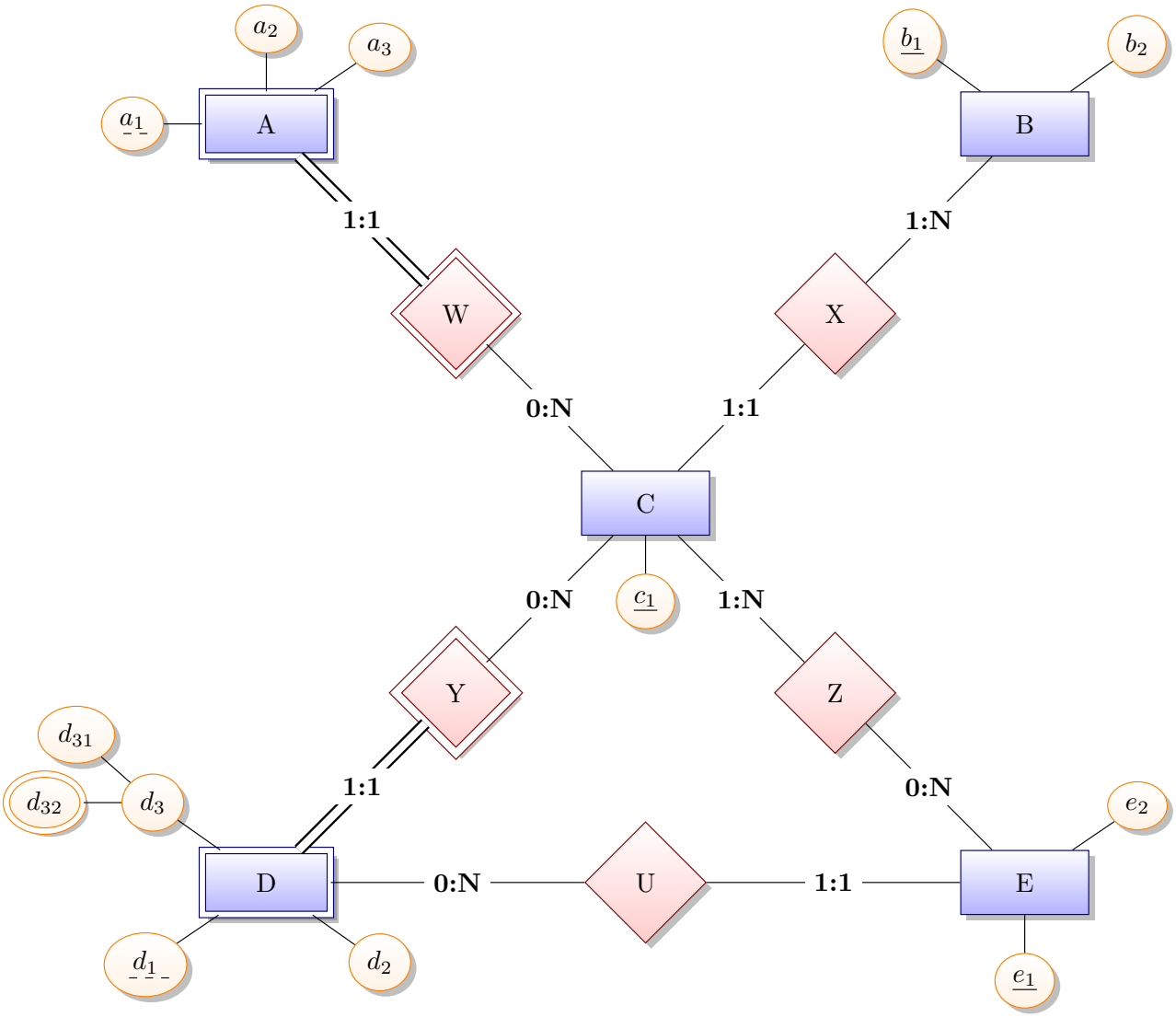
- The database should record information about **Companies**, **Internship Opportunities**, and **Students**.
- A **Company** is identified by their *name*. For each company we also record the *year* the company was incorporated. Furthermore, each company can have one or more **branches**. For each branch we record the location (an *address* consisting of a *street*, *streetnumber*, *city*, *state*, and *zip*) the *number of employees*. The location of a branch is unique per company.
- An **Internship opportunity** is advertized for one branch of a company. For each internship opportunity we record a *title*, *description*, the *weekly hours*, a *start date* and *end date*, and *number of positions*. An internship opportunity is uniquely identified through its *title* and *start date* together with the *branch* for which the opportunity is advertized.
- **Students** are uniquely identified by their *UIN*. For each *student* we record a *name* consisting of one or more *given names* and *lastname*.
- Each **Internship** is for a specific *student* and *internship opportunity*.

Part 3.2 Translation of ER into Relational Model (Total: 40 Points)

Question 3.2.1 (40 Points)

Take the following ER-model and translate it into a relational schema using the rules presented in class. Present the relational schema as an SQL script (assume that all attributes are of data type `INT`). Present the results of the following intermediate steps in this order:

1. Translate strong entities + unnest composite attributes
2. Translate weak entities
3. Translated multi-valued attributes
4. Translate relationships



Part 3.3 Normalization (Total: 10 (BONUS) Points)

Question 3.3.1 (10 (BONUS) Points)

Consider the following relations and for each determine in which normal form the relation is (note that a relation can be in multiple normal forms). Please consider the following normal forms: 1NF, 2NF, 3NF and BCNF.

1. $R(A, B, C, D, E, F)$ and the functional dependencies are $E \to B$, $AD \to C$, $CF \to A$, $A \to B$

2. $R(A, B, C, D, E, F)$ and the functional dependencies are $A \to B$, $BC \to DE$, $B \to F$, $AD \to F$

3. $R(A, B, C, D, E, F)$ and the functional dependencies are $A \to DE$, $A \to C$, $DE \to A$, $C \to B$, $B \to F$

4. $R(A, B, C, D, E, F)$ and the functional dependencies are $F \to B$, $B \to C$, $B \to D$, $D \to F$, $F \to ACE$, $B \to A$, $D \to AC$, $B \to F$, $B \to E$, $D \to E$