

School of Informatics

## Exam

Course: Database systems

Code: IT121G

Credits: 2hp

Date: 2025-06-05

Time: 14:15-19:30

Responsible teacher: Jesper Holgersson

Concerned teachers: Jesper Holgersson, Christian Lennerholt

Aids/appendix: All types of language dictionaries and other office supplies.

### Instructions

- ☐ Use a new paper for each teacher
- ☒ Use a new paper for each question
- ☒ Only write on one side of the paper
- ☒ Write your name and personal identification number on all submitted pages.
- ☐ Number the papers
- ☒ Don't use red ink
- ☒ Mark with an X on the cover page which questions you have answered

**Skrivningsresultat bör offentliggöras inom 18 arbetsdagar**

*Lycka till!*

Antal sidor totalt

# Database systems

## Exam

### 2025-06-05

#### Block 1: Basic modeling skills

Answer the questions below. Carefully describe and motivate your answers.

- 1) Explain the difference between disjoint and overlapping inheritance. ***Use an example of your own as a support to your answer.***
- 2) Create a data model in IE based on the domain description below. Then transfer the data model to tables. If there is inheritance present, transfer these into tables who first and foremost support flexibility and scalability.

A dish is identified by name and also has a price. A dish may be either vegetarian or meat. Vegetarian dishes have the properties color and nutrition content. Meat dishes have the properties kind of meat and meat content.

- 3) Explain what a derived attribute is and why it should not be included when converting a data model into database tables. ***Provide an example to support your explanation.***

## Block 2: Modeling

### Question 4

Order and organization have always been important to the student Pelle. Therefore, he has decided to stop using paper stored in binders to keep track of everything he eats and instead use a simple database. However, Pelle has not yet taken any course in databases and is asking you for help.

1) Create a data model expressed as a UML class diagram based on the domain description below.

2) Then convert the model into a relational data model (tables). Any inheritance should be implemented with consideration for performance. State any assumptions you make.

**Meal:** A meal is partially identified by the date together with the drink name and pizza name. A meal has a rating and a comment. The price of a meal should also be possible to calculate. A meal always includes a drink name and a pizza name.

**Drink:** Identified by the drink name and has a price. A drink is either a wine, a beer, or a soft drink. Wine has the attributes: color (red/white/rosé) and grape variety (e.g., Pinot Noir, Chardonnay, Riesling). Beer has the attributes: type and alcohol content. Soft drink has the attributes: flavor (Cola, Orange, Lemon) and whether it is sugar-free or not. A drink can be included in many meals.

**Pizza:** Identified by the pizza name and also has a price. A pizza can be included in many meals. A pizza always has exactly one main ingredient but may also have many other ingredients. (For example, a kebab pizza has the main ingredient "kebab" but also includes cheese, tomato, mushrooms, and dough.)

**Ingredient:** Identified by name and has a specific type. An ingredient can be the main ingredient on many pizzas and can also be a regular ingredient on many pizzas. An ingredient can have multiple flavors.

### Question 5

As spring approaches, it's important to keep your garden organized—and a simple database is a key tool for doing so. Create an ER model based on the domain description below. Then convert your data model into tables.

**Garden Plot:** A garden plot is identified by a number. Each plot has an area size and a location (e.g., shade, sun, etc.). A garden plot can have multiple soil types, and a soil type can exist in multiple garden plots. A garden plot can have several crops growing in it.

**Crop:** Identified by its Latin name. A crop also has a common name and growth conditions (e.g., sun, shade, lots or little water, etc.). Some crops cannot grow together with other specific crops, and this must be storable in the database. A crop can grow in multiple garden plots and can be affected by many threats. A crop can be involved in many countermeasures.

**Threat:** A threat is identified by its name, such as snail, aphid, or frost. Each threat has a danger level (1–10, where 1 is harmless and 10 is deadly). A threat belongs to a certain type. A threat can apply to many crops and can be included in many countermeasures.

**Countermeasure:** Identified partially by name together with the threat being countered and the crop being protected. A countermeasure applies to one threat and one crop. Each countermeasure has a type and a price.