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Final Exam
2518 – Databases
October 21, 2009

Answer the following questions to your best knowledge. In order to pass you need to earn at least 30 points. Good luck!

1. Present the three levels of abstraction in the database management system (also called the ANSI-SPARC three-level architecture). Also, explain what *data independence* means in this framework. **(20 points)**
2. Explain the integrity constraints (including the integrity rules) and their roles in relational database design. **(20 points)**
3. Consider the following tables that are part of a relational database system:

Factory (factoryNo, name, address)

Toy (toyNo, factoryNo, type, price)

Here, **Factory** contains toy factory details with factoryNo as the primary key, and **Toy** contains toy details produced at each factory with toyNo and factoryNo as the (composite) primary key. Formulate the following queries in SQL:

- a. List full details of all factories. **(1 point)**
- b. List full details of all factories in Norway. **(1 point)**
- c. List all toys of type *doll* or *teddy bear* with a price below €15, in descending order of price. **(2 points)**
- d. Present the number of factories in the database. **(2 points)**
- e. Present the average price of toys produced at each factory. **(3 points)**
- f. List the price and type of all toys produced at the *Fisher Price* factories. **(3 points)**
- g. List the number of different toys produced at each factory. **(3 points)**
- h. List the number of different toys produced at each factory in Finland. List only the factories that produce less than 5 different toys. **(5 points)**