

Repetisjonsoppgaver

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December 4, 2012

Ps, er masse skrivefeil her. Har ikke tid å gå gjennom alt slik at det er helt riktig.

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Part I

Introduksjon

C&B Exercises 1.2, 1.4–1.6, 2.1, 2.5–2.7, 3.10, 4.1 og 4.3–4.4

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1.2 Discuss each of the following terms:

- a) data
- b) database
- c) database management system
- d) database application program
- e) data independence
- f) security
- g) integrity
- h) views

1.4 Describe the main characteristics of the database approach and contrast it with the file-based approach.

1.5 Describe the five components of the DBMS environment and discuss how they relate to each other.

1.6 Discuss the roles of the following personnel in the database environment:

- a) data administrator
- b) database administrator
- c) logical database designer
- d) physical database designer
- e) application developer
- f) end-users

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2.1 Discuss the concept of data independence and explain its importance in a database environment.

2.5 Describe the types of facilities that you would expect to be provided in a multi-user DBMS.

2.6 Of the facilities described in your answer to question 2.5, which ones do you think would not be needed in a standalone PC DBMS? Provide justification for your answer.

2.7 Discuss the function and importance of the system catalog.

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3.10 Describe the main components in a DBMS.

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4.1 Discuss each of the following concepts in the context of the relational data model:

- a) relation
- b) attribute
- c) domain
- d) tuple
- e) intension and extension
- f) degree and cardinality

4.3 Describe the differences between a relation and a relation schema. What is a relational database schema?

4.4 Discuss the properties of a relation.

Part II

SQL og relasjonsalgebra

C&B Exercises 5.8, 5.14–5.24 (bare for relasjonsalgebra) og 6.7–6.26

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5.8 Describe the relations that would be produced by the following relational algebra operations:

$\Pi\sigma \bowtie \supseteq \supset \bowtie$

a) $\Pi_{\text{hotelNo}} (\sigma_{\text{price} > 50}(\text{Room}))$

b) $\sigma_{\text{Hotel.hotelNo} = \text{Room.hotelNo}} (\text{Hotel} \times \text{Room})$

c) $\Pi_{\text{hotelName}} (\text{Hotel} \bowtie \text{Hotel.hotelNo} = \text{Room.hotelNo} (\sigma_{\text{price} > 50}(\text{Room})))$

d) $\text{Guest} \bowtie (\sigma_{\text{dateTo} \geq \text{'1-Jan-2007'}}(\text{Booking}))$

e) $\text{Hotel} \supset_{\text{Hotel.hotelNo} = \text{Room.hotelNo}} (\sigma_{\text{price} > 50}(\text{Room}))$

f) $\Pi_{\text{guestName, hotelNo}} (\text{Booking} \bowtie_{\text{Booking.guestNo} = \text{Guest.guestNo}} \text{Guest}) \div \Pi_{\text{hotelNo}} (\sigma_{\text{city} = \text{'London'}}(\text{Hotel}))$

Formulate the following queries in relational algebra, tuple relational calculus, and domain relational calculus.

5.14 List all employees.

5.15 List all the details of employees who are female.

5.16 List the names and addresses of all employees who are managers.

5.17 Produce a list of the names and addresses of all employees who work for the IT department.

5.18 Produce a list of the name sof all employees who work on the SCCS project.

5.19 Produce a complete list of all managers who are due to retire this year, in alphabetical order of surname.

Formulate the following queries in relational algebra.

5.20 Find out how many employees are managed by “James Adam.”

5.21 Produce a report of the total hours worked by each employee.

5.22 For each project on which more than two employees worked, list the project number, project name, and the number, of employees who work on that project.

5.23 List the total number of employees in each department for those departments with more than 10 employees. Create an appropriate heading for the columns of the results table.

5.24 Analyze the RDBMSs that you are currently using. What types of relational language does the system provide? For each of the languages provided, what are the equivalent operations for the eight relational algebra operations defined in Section 5.1

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Simple queries

6.7 List full details of all hotels.

6.8 List full details of all hotels in London.

6.9 List the names and addresses of all guest living in London, alphabetically ordered by name.

6.10 List all double or family rooms with a price below £40.00 per night, in ascending order of price.

6.11 List the bookings for which no dateTo has been specified.

Aggregate functions

6.12 How many hotels are there?

6.13 What is the average price of a room?

6.14 What is the total revenue per night from all double rooms?

6.15 How many different guest have made bookings for August?

Subqueries and joins

6.16 List the price and type of all rooms at the Grosvebir Hotel.

6.17 List all guest currently staying at the Grosvenor Hotel.

6.18 List the details fo all rooms at the Grosvenor Hotel, including the name of the guest staying in the room, if the room is occupied.

6.19 What is the total income from bookings for the Grosvenor Hotel today?

6.20 List the rooms that are currently unoccupied at the Grosvenor Hotel.

6.21 What is the lost income from unoccupied rooms at the Grosvenor Hotel?

Grouping

6.22 List the number of rooms in each hotel.

6.23 List the number of rooms in each hotel in London.

6.24 What is the average number of bookings for each hotel in August?

6.25 What is the most commonly booked room type for each hotel in London?

6.26 What is the lost income form unoccupied rooms at each hotel today?

Part III

Utvikling av databasesystemer

C&B Exercises 4.7, 7.13, 7.17, 7.25, 10.4, 10.7, 10.8, 10.10, 10.13 (men bare for case study B.1)

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4.7 What is a view? Discuss the difference between a view and a base relation.

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7.13 Create a view containing the hotel name and the names of the guest staying at the hotel.

7.17 Consider the following view defined on the Hotel schema:

```
CREATE VIEW HotelBookingCount (hotelNo, bookingCount)
AS SELECT h.hotelNo, COUNT(*)
   FROM Hotel h, Room r, Booking b
   WHERE h.hotelNo = r.hotelNo AND r.roomNo = b.roomNo
   GROUP BY h.hotelNo;
```

For each of the following queries, state whether the query is valid, and for the valid one, show how each of the queries would be mapped on to a query on the underlying base tables.

- a) `SELECT * FROM HotelBookingCount;`
- b) `SELECT hotelNo FROM HotelBookingCount WHERE hotelNo = 'H001';`
- c) `SELECT MIN(bookingCount) FROM HotelBookingCount;`
- d) `SELECT COUNT(*) FROM HotelBookingCount;`
- e) `SELECT hotelNo FROM HotelBookingCount WHERE bookingCount > 1000;`
- f) `SELECT hotelNo FROM HotelBookingCount ORDER BY bookingCount;`

7.25 Create a view consisting of the Employee and Department tables without the address, DOB, and sex attributes.

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10.4 Discuss what a user view represents in the context of a database system.

10.7 What are the main purposes of data modeling and identify the criteria for an optimal data model?

10.8 Identify the stage(s) in which is appropriate to select a DBMS and describe an approach to selecting the “best” DBMS.

10.10 Discuss why testing cannot show the absence of fault, only that software faults are present.

10.13 Describe the process of evaluating and selecting a DBMS product for each of the case studies described in Appendix B1.

Part IV

Konzeptuell datamodellering

C&B Exercises 12.1, 12.2 , 12.5, 12.8, 12.9, 12.12, 12.13, 16.2, 16.5, 16.6, 16.9, 16.10, 16.12

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12.1 Describe what entity types represent in an ER model and provide examples of entities with a physical or conceptual existence.

12.2 Describe what relationship types represent in an ER model and provide examples of entities with a physical or conceptual existence.

12.5 What are integrity constraints and how does multiplicity model these constraints?

12.8 Describe how strong and weak entity types differ and provide an example of each.

12.9 Describe how fan and chasm traps can occur in an ER model and how they can be resolved.

12.12 Read the fucking text on page 347!

- a) Identify the main entity types of the DVD rental company.
- b) Identify the main relationship types between the entity types described in part a) and represent each relationship as an ER diagram.
- c) Determine the multiplicity constraints for each relationship described in part b) Represent the multiplicity for each relationship in the ER diagrams created in part b)
- d) Identify attributes and associate them with entity or relationship types. Represent each attribute in the ER diagrams created in c)
- e) Determine candidate and primary key attributes for each (strong) entity type.
- f) Using your answers for parts a) to e), attempt to represent the data requirements of the DVD rental company as a single ER diagram. State any assumptions necessary to support your design.

12.13 Create an ER model for each of the following descriptions:

- a) A large organization has several parking lots, which are used by staff.
- b) Each parking lot has a unique name, location, capacity, and number of floors (where appropriate).
- c) Each parking lot has parking spaces, which are uniquely identified using a space number.
- d) Members of staff can request the use of a parking space. Each member of staff has a unique number, name, telephone extension number, and vehicle license number.
- e) Represent all the ER models described in parts a), b), c) and d) as a single ER model. Provide any assumptions necessary to support your model.

The final answer to this exercise is shown as Figure 13.11

Part V

Databasekonstruksjon

C&B Exercises 4.5, 4.6, 13.2, 13.6, 13.7, 13.11, 17.1, 17.2, 17.5

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4.5 Discuss the differences between the candidate keys and the primary key of a relation. Explain what is meant by a foreign key. How do foreign keys of relations relate to candidate keys? Give examples to illustrate your answer.

4.6 Define the two principal integrity rules for the relational model. Discuss why it is desirable to enforce these rules.

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13.2 Describe the relationship between a superclass and its subclass.

13.6 Describe and contrast the process of specialization with the process of generalization.

13.7 Describe the two main constraints that apply to a specialization/generalization relationship.

13.11 Introduce specialization/generalization concepts into the ER model shown in Figure 13.11 and described in Exercise 12.13 to show the following:

a) The majority of parking spaces are under cover and each can be allocated for use by a member of staff for a monthly rate.

b) Parking spaces that are not under cover are free to use when available.

c) Up to twenty covered parking spaces are available for use by visitors to the company. However, only members of staff are able to book out a space for the day of the visit. There is no charge for this type of booking, but the member of staff must provide the visitor's vehicle license number.

The final answer to this exercise is shown as Figure 17.14

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17.1 Discuss the purpose of logical database design.

17.2 Describe the rules for deriving relations that represent:

a) strong entity types:

b) weak entity types:

c) one-to-many (1:*) binary relationship types:

d) one-to-one (1:1) binary relationship types:

e) one-to-one (1:1) recursive relationship types:

f) superclass/subclass relationship types:

g) many-to-many (*:*) binary relationship types:

h) complex relationship types:

i) multi-valued attributes:

Give examples to illustrate your answers.

17.5 Describe the purpose of integrity constraints and identify the main types of integrity constraint on a logical data model.

Part VI

Normalisering og lagrede rutiner

C&B Exercises 8.5, 8.6, 8.7, 8.8, 8.9, 8.13, 14.1, 14.3, 14.4, 14.8, 14.10, 14.11, 14.14, 15.6

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8.5 What are SQL cursors? Give an example of the use of an SQL cursor.

8.6 What are database triggers and what could they be used for?

8.7 Discuss the differences between BEFORE, AFTER, and INSTEAD OF triggers. Give examples to illustrate your answers.

8.8 Discuss the differences between row-level and statement-level trigger. Give examples to illustrate your answers.

8.9 Discuss the advantages and disadvantages of database triggers.

8.13 Analyze the RDBMS that you are currently using and determine the support the system provides for SQL programming construct, database triggers, and recursive queries. Document the differences between each system and the SQL standard.

Page 389-390

14.1 Describe the purpose of normalizing data.

14.3 Describe the types of update anomaly that may occur on a relation that has redundant data.

14.4 Describe the concept of functional dependency.

14.8 What is the minimal normal form that a relation must satisfy? Provide a definition for this normal form.

14.10 Describe the concept of full functional dependency and describe how this concept relates to 2NF. Provide an example to illustrate your answer.

14.11 Describe the concept of transitive dependency and describe how this concept relates to 3NF. Provide an example to illustrate your answer.

14.14 Examine the Patient Medication Form for the Wellmeadows Hospital case study (see Appendix B) shown in Figure 14.18.

a) Identify the functional dependencies represented by the attributes shown in the form in Figure 14.18. State any assumptions that you make about the data and the attributes shown in this form..

b) Describe and illustrate the process of normalizing the attributes shown in Figure 14.18 to produce a set of well-designed 3NF relations.

c) Identify the primary, alternate, and foreign keys in your 3NF relations.

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15.6 On completion of Exercise 14.14, examine the 3NF relations created to represent the attributes shown in the Wellmeadows Hospital form shown in Figure 14.18. Determine whether these relations are also in BCNF. If not, transform the relations that do not conform into BCNF.

Part VII

XML og web-teknologi

Repetisjons oppgaver på fronter. Eget ark.

Part VIII

Behandling av XML-data

Repetisjons oppgaver på fronter. Eget ark.

Part IX

XML validering

Repetisjons oppgaver på fronter. Eget ark.

Part X

Fysisk lagring og fysisk datamodell

C&B 18.1, 18.2 og 18.4, Repetisjons oppgaver på fronter. Eget ark.

Page 494

18.1 Explain the difference between conceptual, logical, and physical database design. Why might these tasks be carried out by different people?

18.2 Describe the inputs and outputs of physical database design.

18.4 Discuss when indexes may improve the efficiency of the system.

Part XI

Sikkerhet og databaseadministrasjon

C&B Exercises 7.9, 20.1–20.2, 22.13–22.15, Repetisjons oppgaver på fronter. Eget ark.

Page 210

7.9 Describe how to access control mechanisms of SQL work.

Page 548

20.1 Explain the purpose and scope of database security.

20.2 List the main types of threat that could affect a database system, and for each describe the controls that you would use to counteract each of them.

Page 625

22.13 Discuss the types of failure that may occur in a database environment. Explain why it is important for a multiuser DBMS to provide a recovery mechanism.

22.14 Discuss how the log file (or journal) is a fundamental feature in any recovery mechanism. Explain what is meant by forward and backward recovery and describe how the log file is used in forward and backward recovery. What is the significance of the write-ahead log protocol? How do checkpoints affect the recovery protocol?

22.15 Compare and contrast the deferred update and immediate update recovery protocols.

Part XII

Transaksjonshåndtering

C&B 22.3

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22.3 Describe, with examples, the types of problem that can occur in a multi-user environment when concurrent access to the database is allowed.