



UNIVERSITETET I BERGEN

KANDIDAT

106

PRØVE

INF115 0 Databaser og modellering

Emnekode	INF115
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General exam information

Oppgave	Tittel	Oppgavetype
i	General info about digital campus exam - INF115, Autumn22	Informasjon eller ressurser

Instructions for Part 1

Oppgave	Tittel	Oppgavetype
i	Instructions for Multiple Choice Questions	Informasjon eller ressurser

Part 1 - Multiple Choice Questions - 20 Points

Oppgave	Tittel	Oppgavetype
1	Use views	Flervalg (flere svar)
2	Subqueries	Flervalg (flere svar)
3	Sparse indices	Flervalg (flere svar)
4	Subtypes	Flervalg (flere svar)
5	Table People	Flervalg (flere svar)
6	Aggregate Functions	Flervalg (flere svar)
7	Databases in the Cloud	Flervalg (flere svar)
8	Algebra	Flervalg (flere svar)
9	Two columns	Flervalg (flere svar)
10	Subqueries	Flervalg (flere svar)

Instructions for Part 2

Oppgave	Tittel	Oppgavetype
i	Instructions Part 2	Informasjon eller ressurser

Part 2 - Concepts - 20 Points

Oppgave	Tittel	Oppgavetype
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11	ER models	Nedtrekk
12	Transactions	Nedtrekk
13	Database Life Cycle	Plasser i tekst

Instructions for Part 3

Oppgave	Tittel	Oppgavetype
i	Instructions for Part 3	Informasjon eller ressurser

Part 3 - Exercise on Diagrams and Queries - 10 Points

Oppgave	Tittel	Oppgavetype
14	Diagram	Plasser i bilde
15	Query 1	Plasser i tekst
16	Query 2	Plasser i tekst
17	Algebra 1	Plasser i tekst
18	Algebra 2	Plasser i tekst

Instructions for Part 4

Oppgave	Tittel	Oppgavetype
i	Instructions for Part 4	Informasjon eller ressurser

Part 4 - Normalization of a Table - 20 Points

Oppgave	Tittel	Oppgavetype
19	Redundancy	Langsvar
20	Functional dependencies	Langsvar
21	Candidate Key	Flervalg (flere svar)
22	Types of dependencies	Flervalg (flere svar)
23	Normal Form	Flervalg (flere svar)
24	Normalise the Table	Langsvar

Mandatory Assignments

Oppgave	Tittel	Oppgavetype
25	Mandatory Assignments	Tekstfelt

1 Use views

Views can be used to:

Select one or more alternatives:

- ☒ Break up complex queries.
- ☒ Store queries in the database.
- ☒ Adapt the database to different users.
- ☐ Guarantee independence of representation of data.

Maks poeng: 2

2 Subqueries

Subqueries can be used in :

Select one or more alternatives:

- ☐ WHATIF clauses
- ☒ UPDATE, INSERT and DELETE clauses
- ☒ SELECT clauses
- ☒ FROM clauses

Maks poeng: 2

3 Sparse indices

Select the correct statements below.

Select one or more alternatives:

- ☒ Dense indices are smaller than sparse indices.
- ☐ Dense indices contain one entry for every entry in the file.
- ☒ Sparse indices contain one entry per block in a file.
- ☐ Multiple sparse indices per file are possible.

Maks poeng: 2

4 Subtypes

Which statements about subtypes are true ?

Select one or more alternatives:

- ☐ A subtype must be an aggregation of another entity.
- ☒ Subtypes can have additional attributes.
- ☒ A subtype is a specialisation of another entity.
- ☐ Subtypes correspond to subsets of the sets of instances.

Maks poeng: 2

5 Table People

We want to create a table *People*.

How to set the primary key ?

Select one or more alternatives:

☐ DROP CONSTRAINT PeoplePK;

☒ PersNr CHAR(11) UNIQUE NOT NULL

☒ CONSTRAINT PeoplePK PRIMARY KEY (PersNr)

☐ PersNr CHAR(15)

Maks poeng: 2

6 Aggregate Functions

Select all **aggregate functions**:

Select one or more alternatives:

☐ UPPER

☒ COUNT

☒ MIN

☐ LOWER

☒ AVG

Maks poeng: 2

7 Databases in the Cloud

Select the correct statements.

Select one or more alternatives:

- ☐ Databases on cloud services are easy to manage and to scale up.
- ☒ A cloud database solution can be based on IaaS, PaaS or SaaS.
- ☒ Security and encryption are of highest importance when working with databases on the web and in cloud services.
- ☐ A database in a cloud service will never be down or in an inconsistent state.

Maks poeng: 2

8 Algebra

Which statements are correct?

Select one or more alternatives:

- ☒ Every query can be written in relational algebra.
- ☒ SQL is based on relational algebra.
- ☐ SQL is not relationally complete.
- ☐ A query language is relationally complete if it is equal in expressive power to relational algebra.

Maks poeng: 2

9 Two columns

Which statements are true?

Two columns compared to each other in a join ...

Select one or more alternatives:

- ☐ can have different datatypes.
- ☐ must have the same name.

☒ can be primary keys.

☒ can be foreign keys.

Maks poeng: 2

10 Subqueries

The subquery ...

Select one or more alternatives:

☒ is run first and the result is substituted into the main query.

☒ cannot contain operators such as IN, ALL etc.

☐ is run after the main query.

☐ can be nested inside another subquery.

Maks poeng: 2

11 ER models

Select the correct alternative for each gap:

The (, ,) diagram is a graphical representation of a database structure. The level of detail in these diagrams

(can vary, cannot change, never changes).

The term (essence, element, entity) is used to describe the object about which

information is stored. They are connected by lines that represent (graphs,

relationships, concepts). For each object we define (algorithms, attributes, alternatives) that contain the relevant pieces of information.

Maks poeng: 4

12 Transactions

Select the correct items and put them in the right order:

A transaction is a (semantic, mathematical, logical) operation on the database,

which takes it from one (inconsistent, random, consistent) state to another

(uniform, inconsistent, consistent) state. A transaction is confirmed by the

(COMMIT, COLLECT, CONFIRM) statement.

A transaction can be (rolled back, held back, sliced up). This means that if any

part of the transaction (functions, figures, fails) then the database is restored to

the state (after, during, before) the transaction started.

The DBMS uses (short, read, random) and (write, fixed,

long) locks to prevent concurrency problems. However, these locks alone (do ensure, do not ensure, guarantee) a correct result. Deadlocks can occur if two or more

transactions (miss, expect, wait for) each other.

Maks poeng: 10

13 Database Life Cyle

Select the correct items and put them in the right order:

 [Hjelp](#)

System Compilation

Deconstruction

Interpretation

1: Preliminary Study

2: Requirements Analysis

3: Design

4: Implementation

5: Production

6: Testing

7: Maintenance

Maks poeng: 6

Data Model

In this exercise, you work on a database for a travel agency.

The database contains several entities:

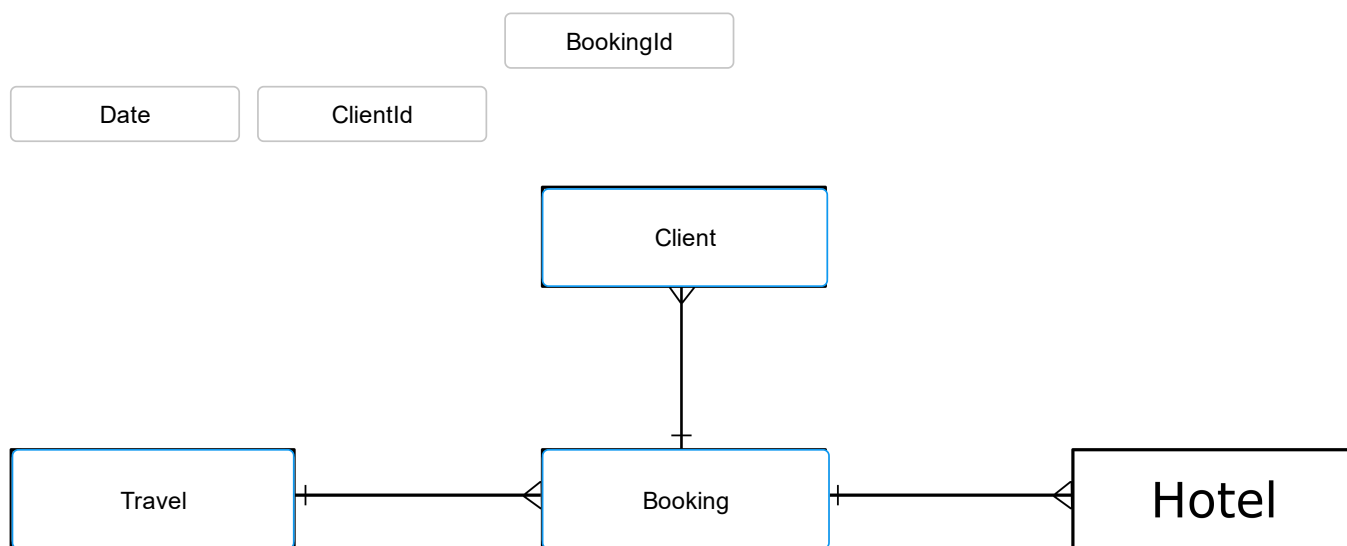
- Client (ClientId, FirstName, LastName, Address, DateOfBirth)
- Booking (BookingId, ClientId*, AccommodationId*, TravelId*, NumberOfPersons, Fee)
- Accommodation (AccommodationId, StartDate, EndDate, Price)
- Travel (TravelId, BeginDate, ReturnDate, OriginLocation, DestinationLocation, Price)

Primary keys are underlined and foreign keys are followed by a star.

14 Diagram

Correctly position the names of the entities in the gaps in this conceptual diagram.

 [Hjelp](#)



Maks poeng: 3

15 Query 1

Place the tokens in the gaps in the query below so that it returns the number of bookings for more than two people booked by each client

 [Hjelp](#)

BookingId		SUM	AVERAGE
Travel	AVG	Client	

SELECT COUNT (*)

FROM Booking

WHERE NumberOfPersons >= 2

GROUP BY ClientId

Maks poeng: 2

16 Query 2

Place the tokens in the gaps in the query below so that it returns the average daily price of each travel and shows this in decreasing order of average daily price.

 [Hjelp](#)

Price/(Duration)	
Booking	
AverageDailyPrice	Client
Price/DATEDIFF(ReturnDate,BeginDate)	
	AveragePrice

SELECT AVG(Price) as

AverageDailyPrice

FROM Travel

ORDER BY DESC AverageDailyPrice

Maks poeng: 2

17 Algebra 1

Translate the following query into relational algebra:

```
SELECT Client.ClientId, Booking.BookingId
FROM Client INNER JOIN Booking ON Client.ClientId = Booking.ClientId
```

Complete the expression below:

 [Hjelp](#)

=	TravelId	BookingId
	x	σ
Π	ClientId, BookingId (Client	<input type="text"/> Client.ClientId =
Booking.ClientId	Booking)	

Maks poeng: 2

18 Algebra 2

Translate the following query into relational algebra:

```
SELECT *
FROM Client
WHERE Year(DateOfBirth) >= 2000
```

Complete the expression below:

 [Hjelp](#)

Travel	Booking	Π	x
σ	Year(DateOfBirth) >= 2000 (Client)

Maks poeng: 1

Normalization Exercise

The table *Auction* contains data about online auctions for objects.

Auction(AuctionId, ObjectName, Description, CategoryId, CategoryName, AuctionClosingDayTime, MinimumPrice, SellerName, SellerEmail, SellerAddress, BidDayTime, BidAmount, BidderName, BidderEmail, BidderAddress)

The example row below tells us that a toaster with AuctionId ABCD01234 was put on sale by seller Engelbretsdatter with email d.engelbretsdatter@nowhere.com and address Ingen Gate 404, Oslo, Norway. The category for this toaster is called electronics with CategoryId 000002. The last day for bidding AuctionClosingDayTime is 2022.09.30 at 13:59 and the minimum price for the toaster is 100 NOK. A bidder with last name Grieg, address Trollhaugen 1, Bergen and email e.grieg@nowhere.com made a bid of 200 NOK for the toaster on 2022-09-29 at 18:01.

('ABCD01234', 'Toaster', 'A nicely used working electrical toaster 1000 Watts', 000002, 'Electronics', 2022-09-30-13:59, 100, 'Engelbretsdatter', 'd.engelbretsdatter@nowhere.com', 'Ingen Gate 404, Oslo, Norway', 2022-09-29-18:01, 200, 'Grieg', 'e.grieg@nowhere.com', 'Trollhaugen 1, Bergen')

The table stores all bids of all bidders for each product.
Email addresses are assumed to be unique for each person.

Answer all six of the questions below.

Note: You must indicate primary keys by underlining them (or use __PKName__) and foreign keys with a trailing star (e.g. FKName*).

You can give names to tables and use the following notation $A \rightarrow B$.

If you make any additional assumptions you can write them in the last text field of the exam.

19 Redundancy

This table contains redundancy. **Give one example of this (maximum 12 words).**

Fill in your answer here

If someone buys more than one object per auction

Ord: 9

Maks poeng: 2

20 Functional dependencies

Now determine and list all functional dependencies in the table.

Note: Please write **one** functional dependency per line.

Maximum 60 words.

Fill in your answer here

```
CategoryID -> CategoryName  
SellerEmail -> SellerName  
SellerEmail -> SellerAddress  
BidderEmail -> BidderName  
BidderEmail -> BidderAddress
```

Ord: 15

Maks poeng: 6

21 Candidate Key

Which columns are part of the candidate key for this table ?

Note: You have to select all correct columns, otherwise zero points are given.

Select one or more alternatives:

☒ AuctionId

☐ ObjectName

☐ Description

☒ CategoryId

☐ CategoryName

☐ AuctionClosingDayTime

☐ MinimumPrice

☐ SellerName

☒ SellerEmail

☐ SellerAddress

☐ BidDayTime

☐ BidAmount

☐ BidderName

☒ BidderEmail

☐ BidderAddress

Maks poeng: 2

22 Types of dependencies

Which of these types of dependencies occur in the table ?

Note: Select all that apply.

Select one or more alternatives:

- ☒ Transitive dependencies
- ☒ Partial dependencies
- ☒ A determinant that is not a super-key

Maks poeng: 3

23 Normal Form

Which are the normal forms verified by the table ?

Note: You have to select all normal forms up to and including the highest normal form that is verified, otherwise zero points are given.

Select one or more alternatives:

- ☐ Boyce-Codd Normal Form
- ☐ Third Normal Form
- ☐ Second Normal Form
- ☒ First Normal Form
- ☐ None of these normal forms

Maks poeng: 2

24 Normalise the Table

Perform the normalization to the Boyce-Codd normal form (BCNF) and describe the result in text form. Remember to indicate the primary and foreign keys in the resulting tables.

Maximum 60 words.

Fill in your answer here

Auction(AuctionID, ObjectID*, SellerEmail*, BidderEmail*, BidAmount,
AuctionClosingDayTime, BidDayTime)
Object(ObjectID, CategoryID*, ObjectName, Description, MinimumPrice)
Category(CategoryID, CategoryName)
Seller(SellerEmail, SellerName, SellerAddress)
Bidder(BidderEmail, BidderName, BidderAddress)

Ord: 20

Maks poeng: 5

25 Mandatory Assignments

Here, you can enter the points (convert to points out of 30) that you earned on your mandatory assignments and leave a comment about the exam.

This field is optional.

Fill in your answer here

292 out of 300

Maks poeng: 30