

Lecture 36: Exam Discussion

- bring a *pencil* and eraser

Announcements

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 - Anything else?

CEDAM Feedback

Please fill out the two forms honestly, quickly but *carefully*

read the instructions first

- one is about the *course* (pink)
- the other is about the *lecturer* (brown)

To ensure confidentiality, I need a student volunteer to send them via the internal mail. *PLEASE!*

Assignment 2 Feedback

- Well done, most submissions were pretty good, many were excellent.
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Stats: mean 7.17, sd 2.1, 46% HD's, 17% fails

Assignment 2 - Example Answer Q1

domains

semester = {*first, second, summer*}

lecturerName = *string*

dayOfWeek = {*Monday, Tuesday, Wednesday, Thursday, Friday*}

timeOfDay = {*i : integer* | $9 \leq i \leq 17$ }

Assignment 2 - Example Answer Q1

attribute	reasoning
unitTitle: string	2
unitCode: string	2
semester: semester	3
year: integer	3
deliveryCoordinator: lecturerName	5
deliveryLecturer: lecturerName	5
studentNumber: int	6
tuteDay: dayOfWeek	8
tuteTime: timeOfDay	8
tutorName: string	8

Attribute *deliveryCoordinator* gives the name of the lecturer who is responsible for coordinating the unit delivery, *deliveryLecturer* gives the name of a lecturer who presents one or more lectures in that unit delivery.

Assignment 2 - Example Answer Q2

We omit the braces $\{\}$ around sets of attributes. The direct reason for a dependency is listed in the reasoning column, with sentence giving the identifying attributes in brackets $()$.

dependency	reasoning
<i>unitCode</i> \longrightarrow <i>unitTitle</i>	2
<i>unitCode, semester, year</i> \longrightarrow <i>deliveryCoordinator</i>	5 (3)
<i>studentNumber, unitCode, semester, year</i> \longrightarrow <i>tuteDay, tuteTime, tutorName</i>	7 (3,2,8)
<i>tuteDay, tuteTime, semester, year, tutorName</i> \longrightarrow <i>unitCode</i>	9
<i>deliveryCoordinator, year, semester</i> \longrightarrow <i>unitCode</i>	10

Assignment 2 - Example Answer Q3

candidate keys

{unitCode, semester, year, studentNumber, deliveryLecturer}

{deliveryCoordinator, semester, year, studentNumber,
deliveryLecturer}

{tuteTime,tuteDay, tutorName, semester, year, studentNumber,
deliveryLecturer}

Assignment 2 - Example Answer Q3

minimal cover

unitCode \longrightarrow *unitTitle*

unitCode, semester, year \longrightarrow *deliveryCoordinator*

studentNumber, unitCode, semester, year \longrightarrow *tuteDay*

studentNumber, unitCode, semester, year \longrightarrow *tuteTime*

studentNumber, unitCode, semester, year \longrightarrow *tutorName*

tuteDay, tuteTime, semester, year, tutorName \longrightarrow *unitCode*

deliveryCoordinator, year, semester \longrightarrow *unitCode*

(many people were lucky here, only “exploding” the RHS’s was needed, you might not be so lucky in the exam!)

Assignment 2 - Example Answer Q3

database schema

Attribute types/domains are not repeated in this schema, see answer to Q1.

unit(unitCode, unitTitle)

coordinator(unitCode, semester, year, deliveryCoordinator)

tutorial(studentNumber, unitCode, semester, year, tuteDay, tuteTime, tutorName)

straglersKey(unitCode, semester, year, studentNumber, deliveryLecturer)

The following tables are removed as “redundant”

uniqueUnit(deliveryCoordinator, year, semester, unitCode)

uniqueTute(tuteDay, tuteTime, semester, year, tutorName, unitCode)

Assignment 2 - Example Answer Q3

highest normal forms

Everything is in at least 3NF, since that's what the algorithm does. Tutorial is only in 3NF since a non-superkey determines something.

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There are 8 questions, topics and marks as follows

- 1 Relational Model **[5 marks]**

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- 2 UML Modelling and Translation **[15 marks]**

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- 6 Transactions and Recovery **[5 marks]**
- 7 Query Processing and File Access **[5 marks]**
- 8 Relational Algebra **[10 marks]**

Exam Format

- 3 hours, + 15 minutes reading

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Exam Format

- 3 hours, + 15 minutes reading
- 8 Questions, covering whole course
- Answer all questions
- Write answers on the question paper
(like the mid-semester test)
- Total marks: 70
(will be scaled to 50 if you do worse than in the
mid-semester test)

Question 1: The Relational Model [5 marks]

(a). **Definitions [1 mark]**

Three true/false questions about definitions of database schema, relation schema, attributes, domains etc.

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(b). **Integrity [4 marks]**

Spot the entity, key, referential integrity violations in some example database states.

UML Modelling and Translation [15 marks]

Two parts

(q). [7 marks]

I show you a class diagram and object diagram, you spot problems, assess potential translations of class diagram to database schema.

UML Modelling and Translation [15 marks]

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(a). [7 marks]

I show you a class diagram and object diagram, you spot problems, assess potential translations of class diagram to database schema.

(b). [8 marks]

I describe a general and a specific situation, you draw a class diagram and an object diagram, translate to db schema and db state.

UML Modelling and Translation Part (a). [7 marks]

(a[i]). **Object Diagram Problems [4 marks]**

Object diagram is meant to be an instance of class diagram, but there are problems, what are they?

UML Modelling and Translation Part (a). [7 marks]

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Object diagram is meant to be an instance of class diagram, but there are problems, what are they?

(a[iii]). **Class Diagram Translations [3 marks]**

Three candidate translations of the class diagram are given. Tell me which is best and what are the main problems with the others.

UML Modelling and Translation (b). [8 marks]

(b[i]). **Class Diagram [2 marks]**

A general situation (involving *kinds* of things) is described, you draw a class diagram to model it.

UML Modelling and Translation (b). [8 marks]

(b[i]). **Class Diagram [2 marks]**

A general situation (involving *kinds* of things) is described, you draw a class diagram to model it.

(b[ii]). **Object Diagram [2 marks]**

A more specific situation (involving *particular* things) is described, you draw an object diagram to model it. Object diagram must be an instance of your class diagram.

UML Modelling and Translation (b). [8 marks]

(b[i]). **Class Diagram [2 marks]**

A general situation (involving *kinds* of things) is described, you draw a class diagram to model it.

(b[ii]). **Object Diagram [2 marks]**

A more specific situation (involving *particular* things) is described, you draw an object diagram to model it. Object diagram must be an instance of your class diagram.

(b[iii]). **Class Diagram Translation [2 marks]**

Translate your class diagram into a database schema.

UML Modelling and Translation (b). [8 marks]

(b[i]). **Class Diagram [2 marks]**

A general situation (involving *kinds* of things) is described, you draw a class diagram to model it.

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A more specific situation (involving *particular* things) is described, you draw an object diagram to model it. Object diagram must be an instance of your class diagram.

(b[iii]). **Class Diagram Translation [2 marks]**

Translate your class diagram into a database schema.

(b[iv]). **Object Diagram Translation [2 marks]**

Translate your object diagram into a state of your database schema.

SQL [13 marks]

Two parts to this one

(a). **SQL Evaluation [5 marks]**

Here is a database state, given as some tables. Here are some SQL queries. What results will the queries give? Write the answer as another table.

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(a). **SQL Evaluation [5 marks]**

Here is a database state, given as some tables. Here are some SQL queries. What results will the queries give? Write the answer as another table.

(b). **Writing SQL [8 marks]**

Here is a database schema. Write SQL queries to retrieve the following information from the database.

- one very simple one, two easy and one slightly difficult: 1, 2, 2, 3 marks
- may involve joins, self-joins, aggregations, nesting

Privacy [2 marks]

Once upon a time, an organisation had a database with personal information in it Were they complying with the principles of the Australian Privacy Act (1988)? Explain.

Functional Dependencies and Normal Forms [15 marks]

Three parts

(a). **Functional Dependencies [4 marks]**

Functional Dependencies and Normal Forms [15 marks]

Three parts

(a). **Functional Dependencies [4 marks]**

(b). **Candidate Keys and Normal Forms [7 marks]**

Functional Dependencies and Normal Forms [15 marks]

Three parts

(a). **Functional Dependencies [4 marks]**

(b). **Candidate Keys and Normal Forms [7 marks]**

(c). **Normalisation [4 marks]**

Functional Dependencies (a). [6 marks]

- give a relation state violating this functional dependency
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Functional Dependencies (a). [6 marks]

- give a relation state violating this functional dependency [1 mark]
- 4 statements about a set of FD's (deriving FD's full and transitive FD's): true or false [2 marks]
- relationship between keys and FD's [1 mark]
- find a minimal cover for a simple set of FD's [2 marks]

Candidate Keys and Normal Forms [5 marks]

Here is a set of functional dependencies and a relation schema.

Tell me

- the candidate keys of the relation
- the highest normal form of the relation (up to BCNF)

Two questions like this, 2 and 3 marks respectively.

Normalisation [4 marks]

Here is a relation schema and a set of functional dependencies

- what's the relations highest normal form? [1 mark]
- decompose the relation, including primary and foreign key constraints to achieve a higher normal form [3 marks]

Transactions and Recovery [5 marks]

Here is a transaction processing schedule. Tell me

- the conflicting pairs of operations
- is it serialisable (and what does that mean?)
- something about how locking may or may not help

Query Processing and File Access [5 marks]

- Tell me about ways of processing joins.
- Some basic ideas about indexes or hashing

Relational Algebra [10 marks]

Three parts here

(a). **true or false [3 marks]**

Six statements. Similar to the mid-semester test (maybe a *bit* easier)

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(b). Evaluation [4 marks]

Here are some relations (written as tables). Evaluate the following relational algebra expressions on these tables. Four expressions, one mark each.

Relational Algebra [10 marks]

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(b). Evaluation [4 marks]

Here are some relations (written as tables). Evaluate the following relational algebra expressions on these tables. Four expressions, one mark each.

(c). SQL to Relational Algebra [3 marks]

Here is an SQL query, write it as a relational algebra expression. One easy one less easy.

That's All Folks!

- Study well and
- best of luck with the exam!!