Revision - Final Exam Information

NoSQL Test

- The NoSQL test was available from 12:00pm, 23 October (Saturday) to 11:59pm, 28 October (Thursday).
- The NoSQL results will be released on 29 October (Friday).
- Special Drop-in Session: 2-3 pm (Tuesday) 2 November.

Final Exam

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  - COMP2400: 5:40 pm, 8 November (Monday) 2021

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- **Venue:** **Online Wattle Exam**

  Refer to the following website for the final exam time

  `https://exams.anu.edu.au/timetable/`

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  - Writing period: 150 minutes

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- Application for deferred-examinations:
  `https://www.anu.edu.au/students/program-administration/assessments-exams/deferred-examinations`

Importance of Final Exam

5%	**Quizzes and Labs**	Best 6 out of 10 quizzes (0.5% $\times$ 6 = 3%) and engaging 4 out of 8 labs (0.5% $\times$ 4 = 2%, at your own choice).
35%	**Assignments**	In total (20% + 15% = 35%).
5%	**NoSQL test**	An online test about NoSQL databases on Wattle.
55%	**Final exam**	The final exam will take place on 8 November 2021 .

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- The final marks will be moderated in the examiners's meeting and may be scaled as a result of this moderation.

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- If you should experience any unexpected issues on Wattle, you will have the option to submit your screen recording as evidence to support your case.

What you need to know before the exam:

- The final exam will be held via this Wattle course site. You can only log in Wattle from **one machine** during your final exam period. Otherwise, your final exam may be terminated by the system.

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- This is an open book exam. However, you must complete this exam independently and with **academic integrity**.
- (Optional) Find screen recording software that you trust works well on your computer (refer to Wattle). Test it, and make sure you can successfully record the whole of your screen for self invigilation.

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- (Optional) At the end of the exam, stop your screen recording, save it, check it, and keep it in a safe place for one month. Do not send it to ANU.

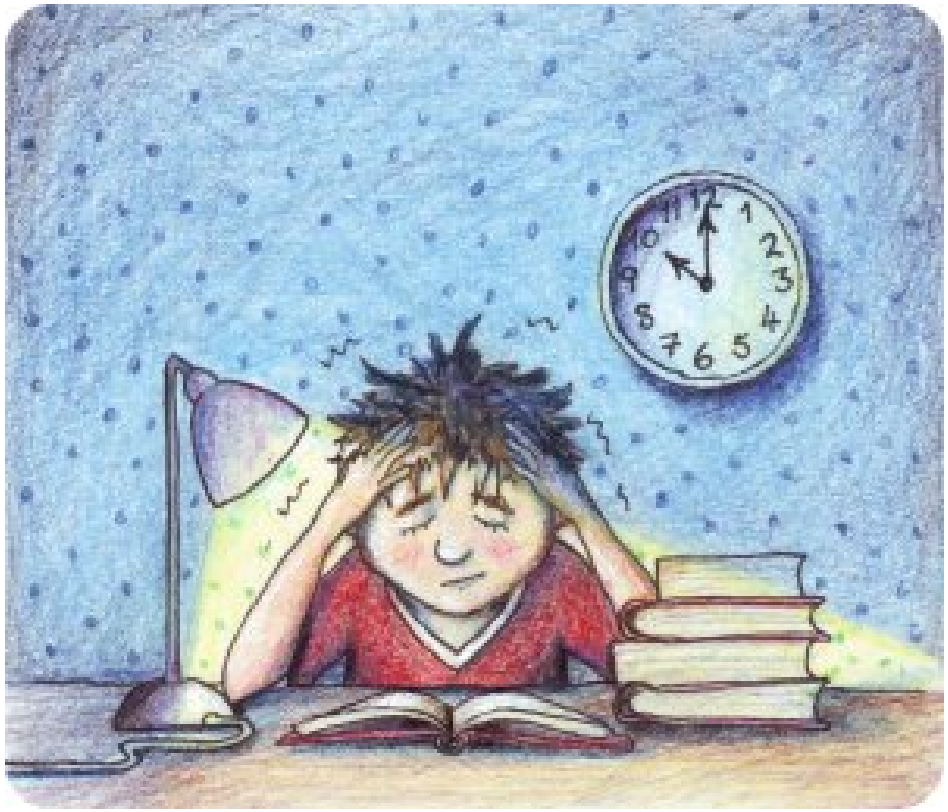
Pre-Final Exam Support

- **Make effective use of the Wattle discussion forum!**
- **Drop-in Sessions (Next Week)**
  1. 4-5 pm, Monday, Nov 1
  2. 7-8 pm, Wednesday, Nov 3
  3. 4-5 pm, Thursday, Nov 4
  4. 4-5 pm, Friday, Nov 5
- **Emails**

  Yu Lin: yu.lin@anu.edu.au or Qing Wang: qing.wang@anu.edu.au

Final Exam

- How to prepare for the final exam for COMP2400/6240?



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  - DatabaseBench: https://cs.anu.edu.au/dab/bench/db-exercises/

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- You may also use the textbook as a reference, or search on Google ...

What have you learned?

Weeks	Lectures/Workshops
1	Introduction to database systems
2	Relational data model
3	SQL
4	Entity-relationship model
5	Functional dependencies
6	Normalisation
7	Relational algebra
8	Query processing and optimisation
9	Database security
10	Database transactions
11	NoSQL Databases

What will be covered in the final exam?

Weeks	Lectures/Workshops
1	Introduction to database systems
2	Relational data model
3	~~SQL~~ (Writing SQL queries will not be assessed)
4	Entity-relationship model
5	Functional dependencies
6	Normalisation
7	Relational algebra
8	Query processing and optimisation
9	Database security
10	Database transactions
11	~~NoSQL Databases~~

Armstrongs Inference Rules in Week 5 workshop slides (slides 16-25) will not be covered.

Execution plan in Week 8 workshop slides (slides 8-27) will not be covered.

What will be covered in the final exam?

Labs	Topics
1	~~Lab Environment~~
2	~~Basic SQL~~
3	~~Advanced SQL~~
4	Entity-Relationship Model
5	Functional Dependencies
6	Normalisation
7	Relational Algebra, and Query Processing and Optimisation
8	~~Database Programming~~

Final Exam - Assignments and Past Exam Papers

- The assignment on SQL will not be covered.

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- The assignment on SQL will not be covered.
- The assignment on database theory is covered.

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- The NoSQL test will not be covered.

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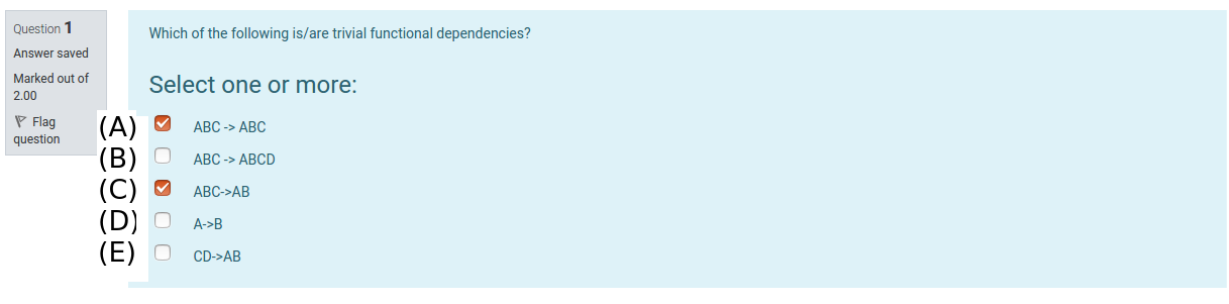
- The assignment on SQL will not be covered.
- The assignment on database theory is covered.
- The NoSQL test will not be covered.
- The final exam paper in 2012 (the specification and solution are available in Wattle). Note the difference.

Final Exam Questions

Question type:

(1) **Multiple Choice Questions (first 10 questions)**

- Select **one or more choices** as desired.
- Partial marks are available and the minimum mark per question is 0.



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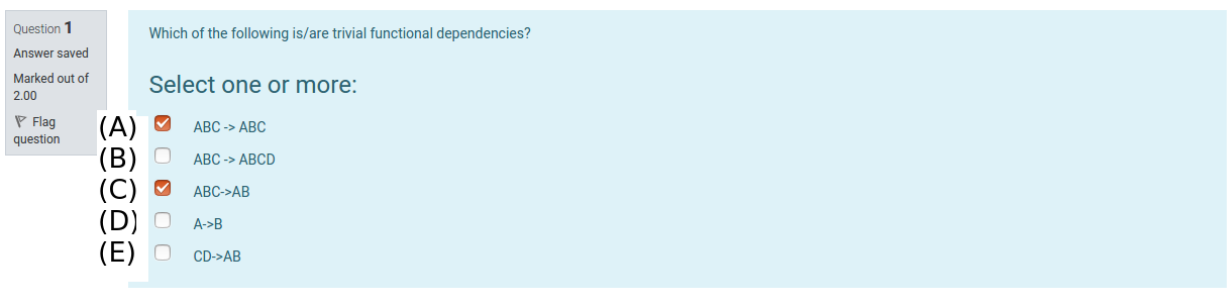

The full mark for each quesion (of five choices) is 2.

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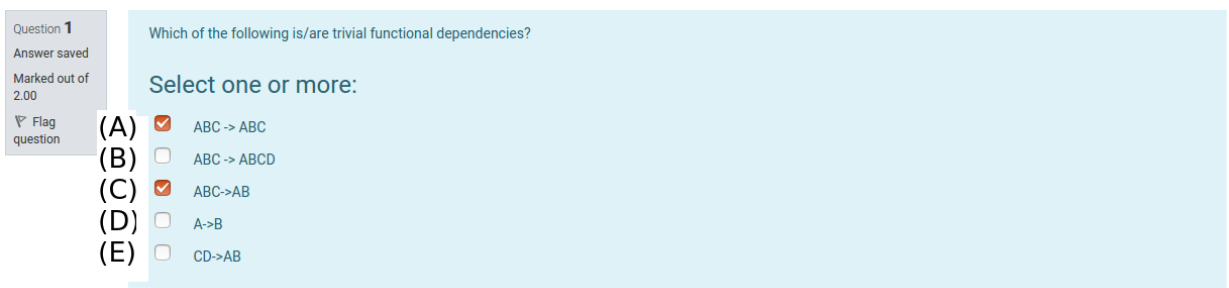

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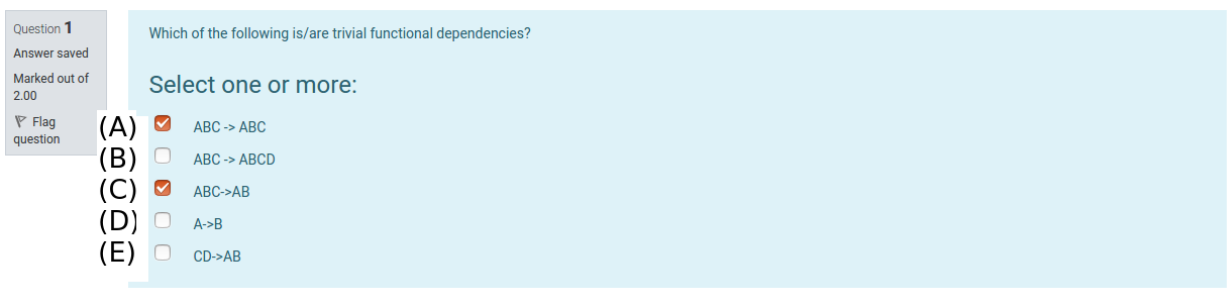

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Assume the correct answer is (A)(C)

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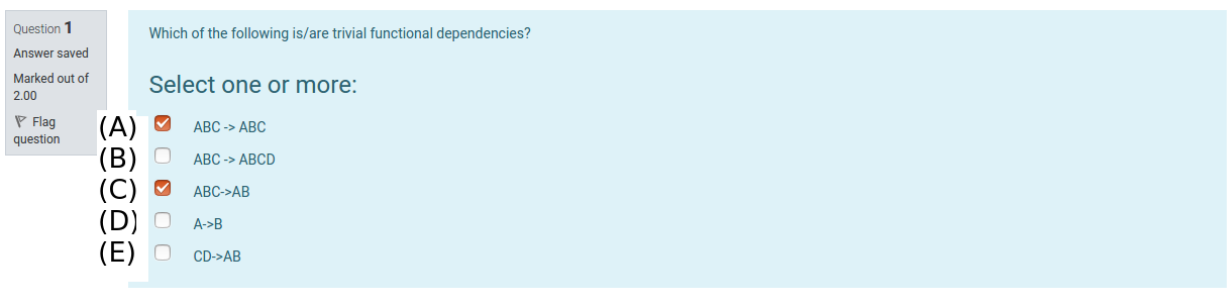

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- (A)(C) will receive 2 (out of 2) marks.

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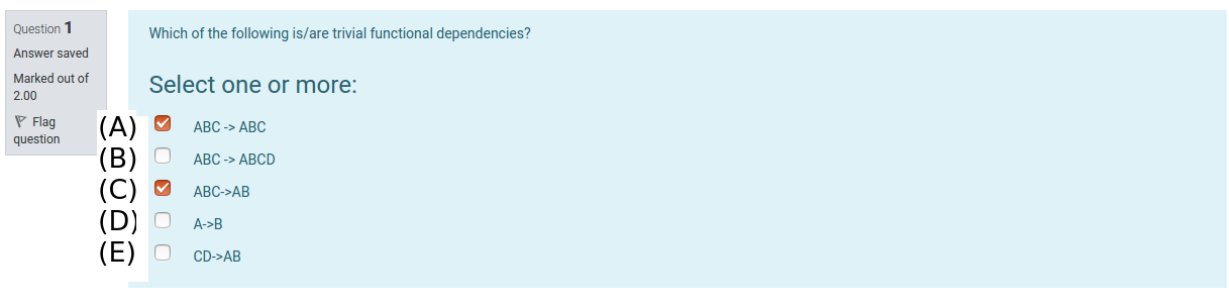

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- (A)(C) will receive 2 (out of 2) marks.
- (A) and (A)(C)(D)

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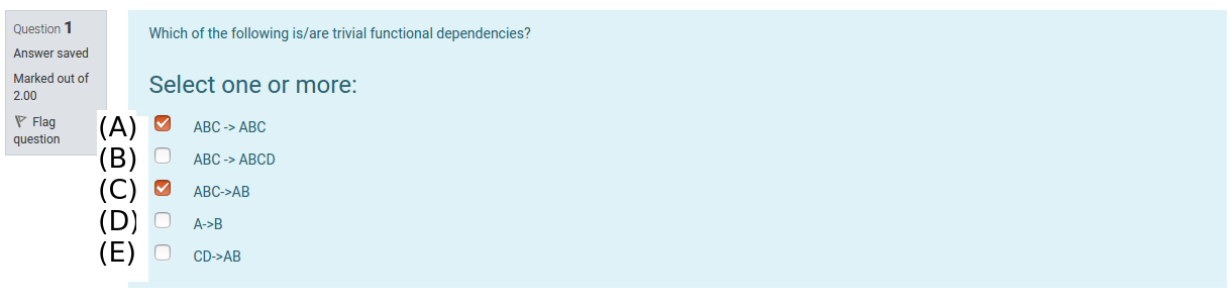

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- (A)(B) and (A)(C)(D)(E)

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- (A)(B)(D) and (D)

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Final Exam Questions

Question type:

(2) **Problem-Solving Questions (remaining 9 questions)**

- Include necessary justifications if instructed.
- Type your answer in the text window (or upload at most one file if you think it is necessary)

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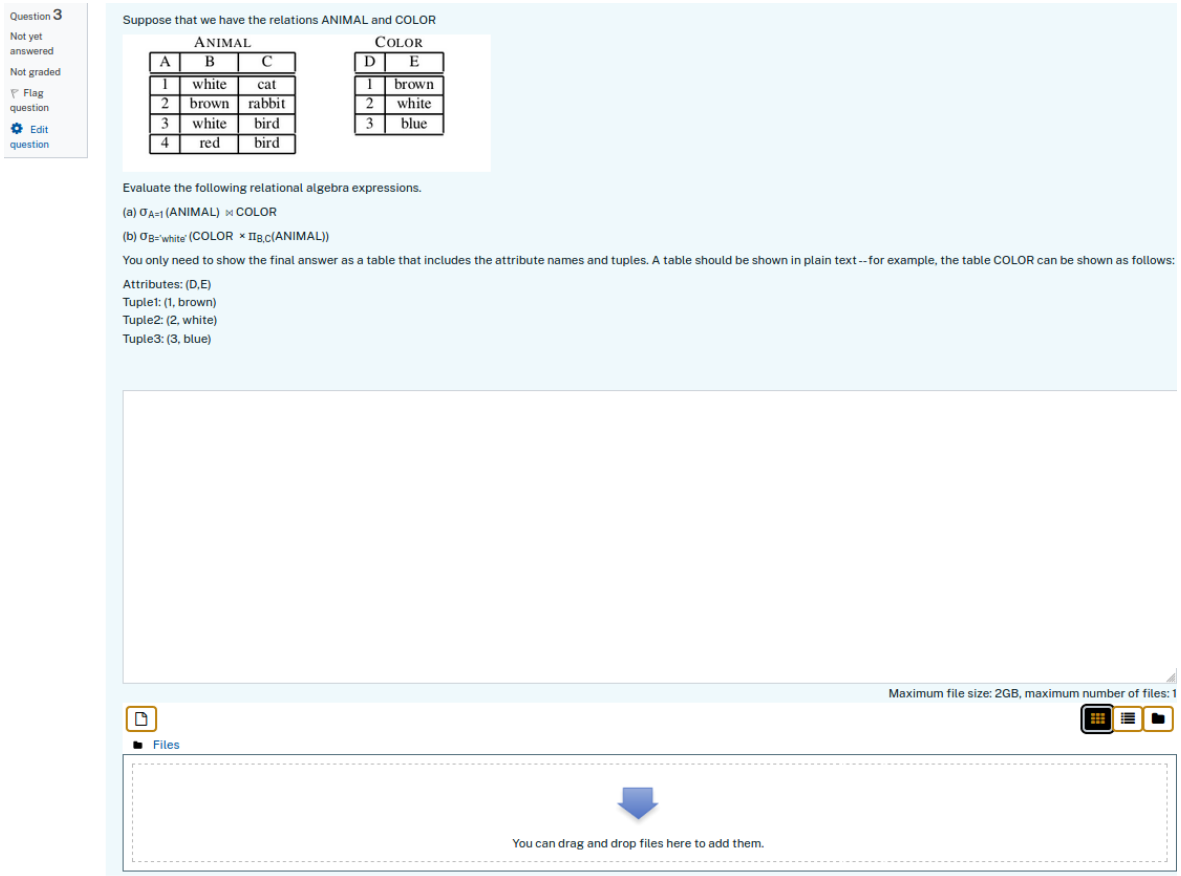


Question 3
Not yet answered
Not graded
Flag question
Edit question

Suppose that we have the relations ANIMAL and COLOR

ANIMAL

A	B	C
1	white	cat
2	brown	rabbit
3	white	bird
4	red	bird

COLOR

D	E
1	brown
2	white
3	blue

Evaluate the following relational algebra expressions.

(a) $\sigma_{A=1}$(ANIMAL) $\bowtie$ COLOR

(b) $\sigma_{B='white'}$(COLOR $\times$ $\Pi_{B,C}$(ANIMAL))

You only need to show the final answer as a table that includes the attribute names and tuples. A table should be shown in plain text -- for example, the table COLOR can be shown as follows:

Attributes: (D,E)
Tuple1: (1, brown)
Tuple2: (2, white)
Tuple3: (3, blue)

Maximum file size: 2GB, maximum number of files: 1

Files

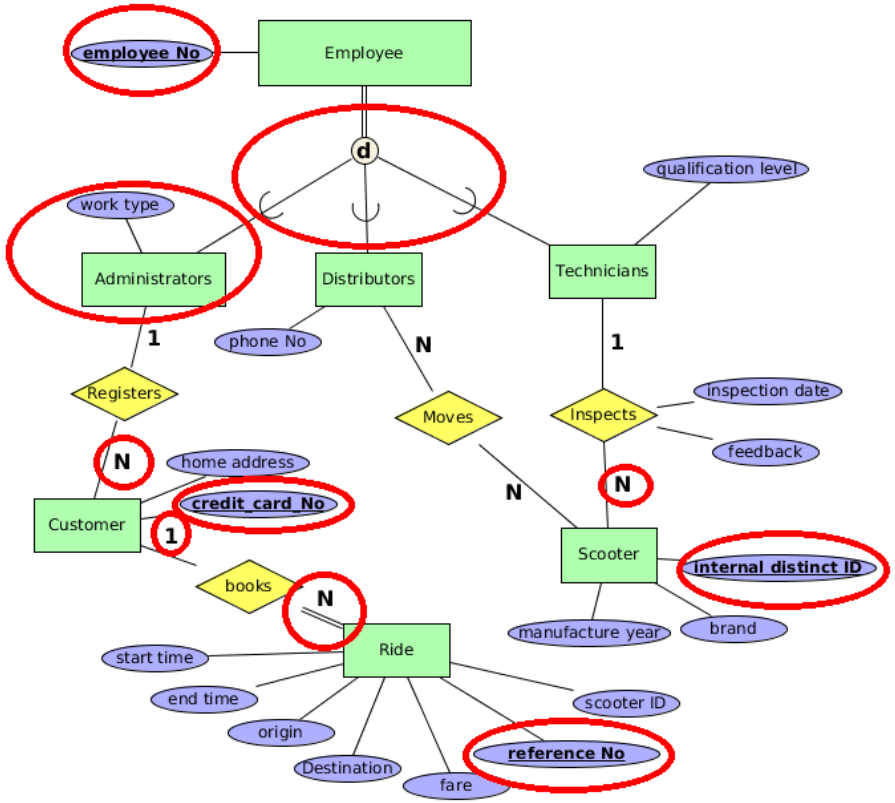
You can drag and drop files here to add them.

Final Exam on Wattle

Final Exam on Wattle

- The final exam will be available on Nov 8 at the bottom of the course Wattle site.
- You can find two mock entries (available from 12pm Oct 30 to 12 pm Nov 7) at the bottom of the course Wattle site.
  - COMP2400 Final Exam (Mock Test)
  - COMP6240 Final Exam (Mock Test)
- In the final exam you must choose either COMP2400 or COMP6240 depending on your enrollment information.

Assignment 2 – Q1



The requirements that cannot be captured in an EER-diagram.

- The work type of administrators can be either remote, onsite or hybrid.
- Once a ride is completed, the customers credit card will be automatically charged by ACTScooter.

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

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How to check whether $\Sigma \models$ AB $\rightarrow$ CDE?

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How to check whether $\Sigma \models$ AB $\rightarrow$ CDE?

- Check whether the closure of AB under Σ contains CDE?

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How to check whether $\Sigma \models$ AB $\rightarrow$ CDE?

- Check whether the closure of AB under Σ contains CDE?
- How to compute the closure of AB under Σ?

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
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- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether $\Sigma \models$ AB $\rightarrow$ CDE?

- Check whether the closure of AB under Σ contains CDE?
- How to compute the closure of AB under Σ?
- $(AB)^+$ = $(ABC)^+$ (using $AB \rightarrow C$) = ABCDE (using $C \rightarrow DE$)

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether $\Sigma \models$ AB $\rightarrow$ CDE?

- Check whether the closure of AB under Σ contains CDE?
- How to compute the closure of AB under Σ?
- $(AB)^+ = (ABC)^+$ (using $AB \rightarrow C$) = ABCDE (using $C \rightarrow DE$)
- The closure of AB under Σ contains CDE and thus $\Sigma \models$ AB $\rightarrow$ CDE.

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

- Check whether ADE is a **superkey**

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

- Check whether ADE is a **superkey** (The closure of ADE is ABCDE?)

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

- Check whether ADE is a **superkey** (The closure of ADE is ABCDE?)
- Check whether ADE is a **minimal** superkey

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

- Check whether ADE is a **superkey** (The closure of ADE is ABCDE?)
- Check whether ADE is a **minimal** superkey (None of AD, AE, DE is a superkey)

Assignment 2 – Q2

Consider the relation schema R $= \{A, B, C, D, E\}$ and the following set Σ of FDs:

- $AB \rightarrow C$
- $BC \rightarrow A$
- $C \rightarrow DE$
- $DE \rightarrow B$

How to check whether ADE is a candidate key (minimal super key)?

- Check whether ADE is a **superkey** (The closure of ADE is ABCDE?)
- Check whether ADE is a **minimal** superkey (None of AD, AE, DE is a superkey)
- ADE is a minimal super key and thus a candididate key.

Assignment 2 – Q2

Minimal Cover Main steps:

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD
  BC $\rightarrow$ A can be reduced to C $\rightarrow$ A because $\Sigma \models$ C $\rightarrow$ A.

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD
  BC $\rightarrow$ A can be reduced to C $\rightarrow$ A because $\Sigma \models$ C $\rightarrow$ A.
  Why AB $\rightarrow$ C cannot be replaced by B $\rightarrow$ C or A $\rightarrow$ C? etc.

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD
  BC $\rightarrow$ A can be reduced to C $\rightarrow$ A because $\Sigma \models$ C $\rightarrow$ A.
  Why AB $\rightarrow$ C cannot be replaced by B $\rightarrow$ C or A $\rightarrow$ C? etc.
  (Refer to Slides 31-32 in Week 5 workshop)

Assignment 2 – Q2

Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD
  BC $\rightarrow$ A can be reduced to C $\rightarrow$ A because $\Sigma \models$ C $\rightarrow$ A.
  Why AB $\rightarrow$ C cannot be replaced by B $\rightarrow$ C or A $\rightarrow$ C? etc.
  (Refer to Slides 31-32 in Week 5 workshop)
- Step (4) Check if there are any redundant FDs (all good).

Assignment 2 – Q2

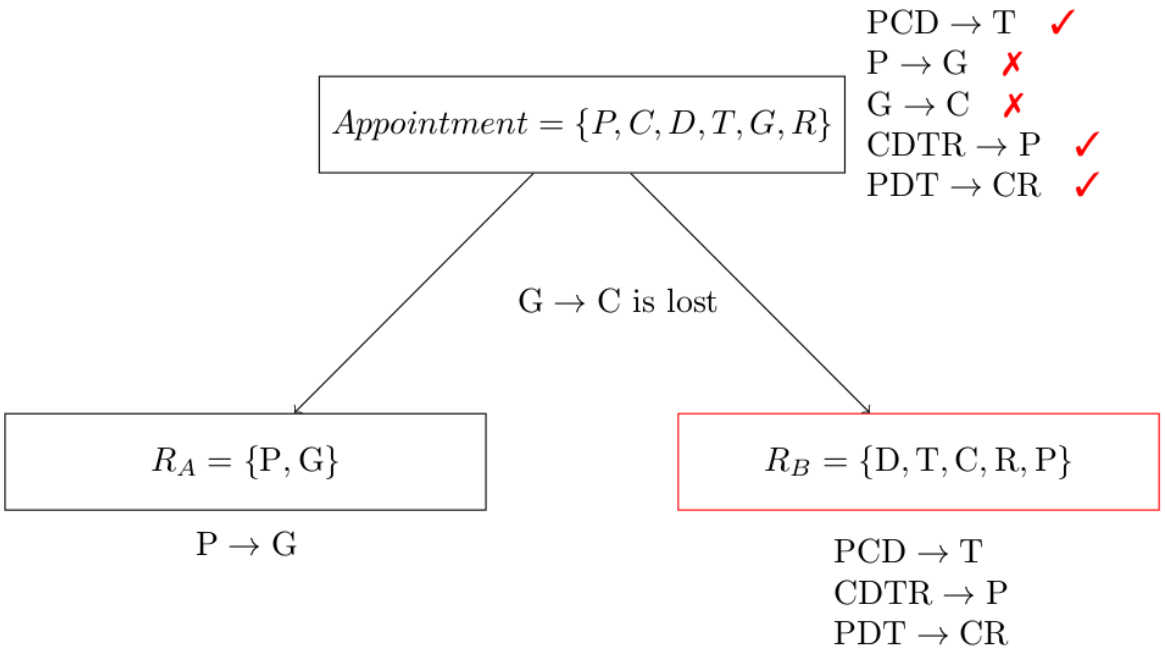
Minimal Cover Main steps:

- Step (1) Start from $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow DE, DE \rightarrow B\}$
- Step (2) Check whether FDs have only one attribute on the righthand side thus we will have $\{AB \rightarrow C, BC \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$
- Step (3) Check whether any redundant attribute can be removed from the left hand side of any FD
  BC $\rightarrow$ A can be reduced to C $\rightarrow$ A because $\Sigma \models$ C $\rightarrow$ A.
  Why AB $\rightarrow$ C cannot be replaced by B $\rightarrow$ C or A $\rightarrow$ C? etc.
  (Refer to Slides 31-32 in Week 5 workshop)
- Step (4) Check if there are any redundant FDs (all good).

The Minimal cover is $\{AB \rightarrow C, C \rightarrow A, C \rightarrow D, C \rightarrow E, DE \rightarrow B\}$

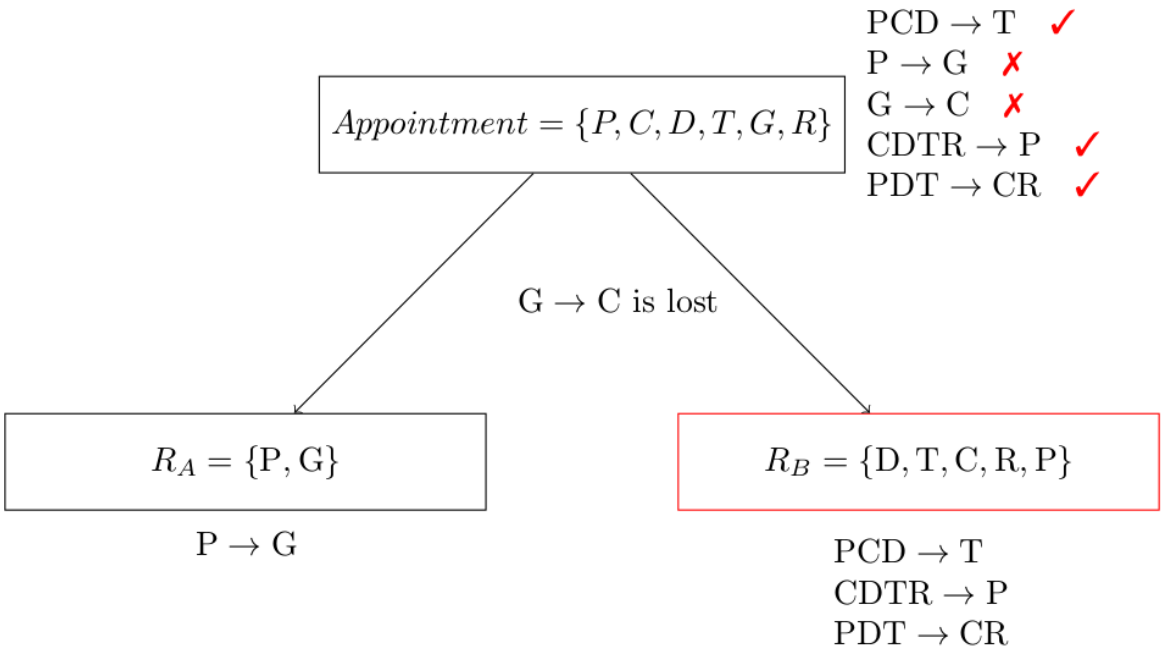
Assignment 2 – Q3

Consider the relation schema APPOINTMENT={P, G, D, T, C, R} and Σ = { PCD $\rightarrow$ T, P $\rightarrow$ G, G $\rightarrow$ C, CDTR $\rightarrow$ P, PDT $\rightarrow$ CR }.



Assignment 2 – Q3

Consider the relation schema APPOINTMENT={P, G, D, T, C, R} and Σ = { PCD $\rightarrow$ T, P $\rightarrow$ G, G $\rightarrow$ C, CDTR $\rightarrow$ P, PDT $\rightarrow$ CR }.



Note that G $\rightarrow$ C is lost because it cannot be recovered (inferred) by the surviving FDs in R_A and R_B.

Assignment 2 – Q4

STUDENT={SID, Name, Degree, College, Address, Phone} with the primary key {SID},

COURSE={CourseNo, College, Semester} with the primary key {CourseNo, Semester},

TUTOR={TID, Email, CourseNo, Semester} with the primary key {TID, CourseNo, Semester} and the foreign keys: [CourseNo,Semester]$\subseteq$COURSE[CourseNo,Semester] and [TID]$\subseteq$STUDENT[SID],

ENROL={SID, CourseNo, Semester, Unit, Status} with the primary key {SID, CourseNo, Semester} and the foreign keys: [CourseNo,Semester]$\subseteq$COURSE[CourseNo,Semester] and [SID]$\subseteq$STUDENT[SID].

Assignment 2 – Q4

STUDENT={SID, Name, Degree, College, Address, Phone} with the primary key {SID},

COURSE={CourseNo, College, Semester} with the primary key {CourseNo, Semester},

TUTOR={TID, Email, CourseNo, Semester} with the primary key {TID, CourseNo, Semester} and the foreign keys: [CourseNo,Semester]$\subseteq$COURSE[CourseNo,Semester] and [TID]$\subseteq$STUDENT[SID],

ENROL={SID, CourseNo, Semester, Unit, Status} with the primary key {SID, CourseNo, Semester} and the foreign keys: [CourseNo,Semester]$\subseteq$COURSE[CourseNo,Semester] and [SID]$\subseteq$STUDENT[SID].

Pay attention to keywords like never, only, always, exactly, etc. which often indicate to use the set difference in the corresponding RA queries.

Questions or Feedback?

The SELT is available in Wattle for you to have your say about your learning experience in this course. This survey seeks feedback about your experience in the entire duration of this course, starting from the first week. We encourage you to have your say as we are very keen to know your overall experience in this course. Your anonymous feedback will help us in planning future offerings of this course.

We value your feedback!