CS 338
Lecture 24
Final Exam Review

Collin Roberts

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1. Motivation to Study Databases
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7. Normalization
8. Transactions
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    1. Indexing
    2. RAID0, RAID1, RAID5
    3. Data Backup
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What questions do you have?

Notes

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1. have been chosen to cover the early part of the course, and
2. should be used in conjunction with the practice questions that have already been posted on the course website, about topics which have not been covered by a Crowdmark assignment.

Topic: Motivation to Study Databases

Q: What are some reasons why we are motivated to study databases?

A (e.g. Lecture 02, Slide 13):

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3. Provide data independence.
4. Provide security, concurrent access and crash recovery.
5. Centralize data administration.

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A (e.g. Lecture 02, Slide 13):

1. Reduce data redundancy.
2. Improve data consistency.
3. Provide data independence.
4. Provide security, concurrent access and crash recovery.
5. Centralize data administration.
6. Reduce application development time.

Topic: DBMS

Q: What are some jobs that a DBMS does for us?
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Q: What are some jobs that a DBMS does for us?
A (e.g. Lecture 02, Slide 14):

1. Set up the storage structures.
2. Perform updates on data.
3. Process queries (requests for data retrieval) from applications and users.

Topic: Relational Data Model

Q: In the Enrollment schema, in which Enrolled.sid is a foreign key to Student.sid, what options do we have if a required tuple is deleted from the Students table?

A (e.g. Lecture 03, Slide 33):

Topic: Relational Data Model

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A (e.g. Lecture 03, Slide 33):

1. Delete related tuples from Enrolled.

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Q: In the Enrollment schema, in which Enrolled.sid is a foreign key to Student.sid, what options do we have if a required tuple is deleted from the Students table?

A (e.g. Lecture 03, Slide 33):

1. Delete related tuples from Enrolled.
2. Disallow deletion of the Student tuple until the related tuples from Enrolled are deleted or modified.

Topic: Relational Data Model

Q: In the Enrollment schema, in which Enrolled.sid is a foreign key to Student.sid, what options do we have if a required tuple is deleted from the Students table?

A (e.g. Lecture 03, Slide 33):

1. Delete related tuples from Enrolled.
2. Disallow deletion of the Student tuple until the related tuples from Enrolled are deleted or modified.
3. Set Enrolled.sid to a default Student.sid.

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Q: In the Enrollment schema, in which Enrolled.sid is a foreign key to Student.sid, what options do we have if a required tuple is deleted from the Students table?

A (e.g. Lecture 03, Slide 33):

1. Delete related tuples from Enrolled.
2. Disallow deletion of the Student tuple until the related tuples from Enrolled are deleted or modified.
3. Set Enrolled.sid to a default Student.sid.
4. Set Enrolled.sid to NULL.

Topic: Relational Algebra

Q: Use the Company schema. Write a Relational Algebra expression to find the last names of all employees having a Salary of at least $50K, and with first name not equal to 'John'.
A (e.g. Lecture 04):

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$$R1 \leftarrow \sigma_{SALARY>=50000}(EMPLOYEE)$$

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A (e.g. Lecture 04):

$$R1 \leftarrow \sigma_{SALARY>=50000}(EMPLOYEE)$$
$$R2 \leftarrow \sigma_{FNAME='John'}(EMPLOYEE)$$

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A (e.g. Lecture 04):

$$
\begin{aligned}
R1 &\leftarrow \sigma_{SALARY>=50000}(EMPLOYEE) \\
R2 &\leftarrow \sigma_{FNAME='John'}(EMPLOYEE) \\
R3 &\leftarrow R1 - R2
\end{aligned}
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A (e.g. Lecture 04):

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\begin{aligned}
R1 &\leftarrow \sigma_{SALARY>=50000}(EMPLOYEE) \\
R2 &\leftarrow \sigma_{FNAME='John'}(EMPLOYEE) \\
R3 &\leftarrow R1 - R2 \\
RESULT &\leftarrow \pi_{LNAME}(R3)
\end{aligned}
$$

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A (e.g. Lecture 05):

$$R1 \leftarrow EMPLOYEE \bowtie_{SSN=ESSN} WORKS\_ON$$

$$R2 \leftarrow \sigma_{HOURS>=10}(R1)$$

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Q: Use the Company schema. Write a Relational Algebra expression to find the names of all employees who have worked at least 10 hours on some project.

A (e.g. Lecture 05):

$$
\begin{aligned}
R1 &\leftarrow EMPLOYEE \bowtie_{SSN=ESSN} WORKS\_ON \\
R2 &\leftarrow \sigma_{HOURS>=10}(R1) \\
RESULT &\leftarrow \pi_{FNAME,LNAME}(R2)
\end{aligned}
$$

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A (e.g. Lecture 07):

$$RESULT \leftarrow g_{SUM(SALARY)\ AS\ TOTAL\_SALARY}(EMPLOYEE)$$

Topic: SQL

Q: Use the Company schema. Write a SQL query to find the last names of all employees having a Salary of at least $50K, and with first name not equal to 'John'.

A:

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SELECT LNAME

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A:

SELECT LNAME
FROM EMPLOYEE

Topic: SQL

Q: Use the Company schema. Write a SQL query to find the last names of all employees having a Salary of at least \$50K, and with first name not equal to 'John'.

A:

SELECT LNAME
FROM EMPLOYEE
WHERE SALARY >= 50000 **AND** FNAME!= 'John';

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SELECT FNAME,LNAME

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A:

SELECT FNAME,LNAME
FROM EMPLOYEE **INNER JOIN** WORKS_ON

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A:

```
SELECT FNAME,LNAME
FROM EMPLOYEE INNER JOIN WORKS_ON
ON SSN = ESSN
```

Topic: SQL

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SELECT FNAME,LNAME
FROM EMPLOYEE INNER JOIN WORKS_ON
ON SSN = ESSN
WHERE HOURS >= 10;
```

Topic: SQL

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SELECT SUM(SALARY)
FROM EMPLOYEE;

Student Course Perception Surveys

1. Please fill out your course evaluations at `http://perceptions.uwaterloo.ca`
2. All the best on your final exams before ours!