CGS 2545: Database Concepts
Summer 2007

EXAM #2 Review

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Material Covered On Exam

- The material covered on the exam is taken only from the on-line lecture notes. There will be no questions on the exam which are Access specific.
- Much of this material also appears in the textbook, however, material that appears **only** in the textbook will not appear on the exam.
- The exam covers the material in Chapters 5 (two sections of notes), and 7.
- Format of the exam will consist of mostly multiple choice and true/false questions with a few work type problems. The work problems will consist of writing SQL queries.

Chapter 5 Details

Logical Database Design And The Relational Data Model

- Relation, attribute, domain, tuple, degree, cardinality, and related terminology.
- You can ignore the more mathematical definition of a relation.
- Be familiar with the definition of a relation as shown on page 11.
- Know the difference between a schema and an instance.
- Be able to convert basic ER diagrams into a set of relational tables.
  - Strong entities with simple, composite, and multi-valued dependencies.
  - Weak entities.
  - Binary 1:M and M:M relationships.
  - Binary 1:1 relationships.
  - Associative entities both with and without defined identifiers.
  - Unary relationships – **Don't worry about this one for the exam.**
  - Supertype/subtype hierarchies.

Chapter 5 – Part 2 Details

Normalization

- Know what normalization is and how it is achieved.
- Concept of a functional dependency.
- Normal forms based upon functional dependencies: (1NF), 2NF, 3NF, and BCNF.
- Insertion, deletion, and update anomalies.
- Be able to convert N2NF tables into 2NF tables.
- Be able to convert N3NF tables into 3NF tables.

Chapter 7 Details

Introduction To SQL

- Table creation in SQL.
- Referential integrity constraints in tables in SQL.
- Inserting, deleting, and updating rows in tables in SQL.
- Queries in SQL.
  - Basic SELECT statement.

    SELECT (attributes)

    FROM (tables)

    WHERE condition

    GROUP BY

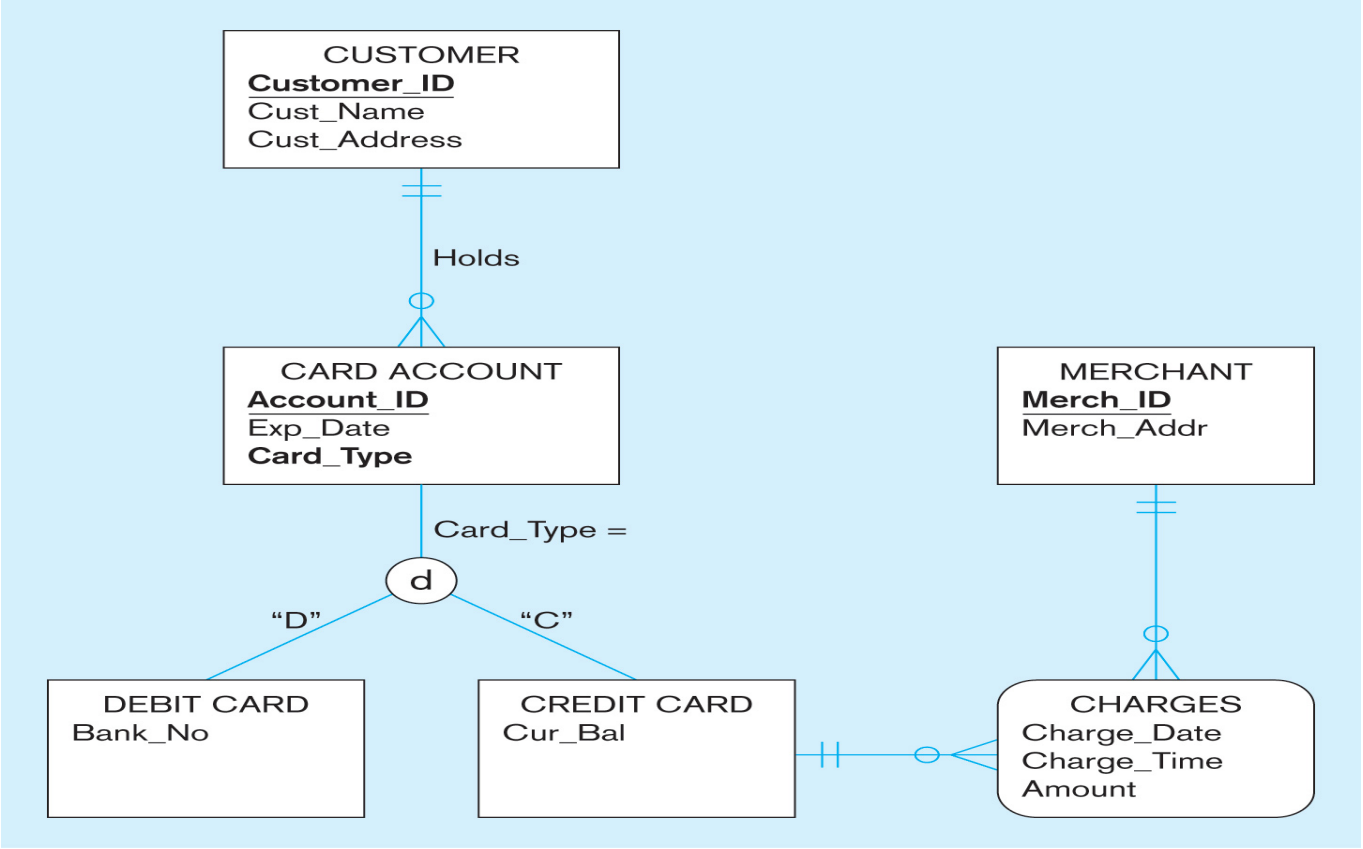
    HAVING

    ORDER BY

Also see "SQL – In class exercises" for more SQL query examples.

Some Example Problems

1. Convert the following ERD into a set of relations (tables) using the guidelines outlined in the notes for Chapter 5.



Some Example Problems

2. The relation scheme CLASS(course_number, section_number, room_number, capacity) is in which normal form given the functional dependency room_number → capacity. If the relation scheme is not in 3NF, decompose it into a set of relation schemas that are in 3NF.

   a) 1NF

   b) 2NF

   c) 3NF

Some Example Problems

3. Using the relation schemas shown below create table definitions in SQL for each of the tables listed.

STUDENT (STUDENT_ID, STUDENT_NAME)

STUDENT_ID	STUDENT_NAME
38214	Letersky
54907	Altvater
66324	Aiken
70542	Marra
...	

QUALIFIED (FACULTY_ID, COURSE_ID, DATE_QUALIFIED)

FACULTY_ID	COURSE_ID	DATE_QUALIFIED
2143	ISM 3112	9/1988
2143	ISM 3113	9/1988
3467	ISM 4212	9/1995
3467	ISM 4930	9/1996
4756	ISM 3113	9/1991
4756	ISM 3112	9/1991
...		

FACULTY (FACULTY_ID, FACULTY_NAME)

FACULTY_ID	FACULTY_NAME
2143	Birkin
3467	Berndt
4756	Collins
...	

SECTION (SECTION_NO, SEMESTER, COURSE_ID)

SECTION_NO	SEMESTER	COURSE_ID
2712	I-2006	ISM 3113
2713	I-2006	ISM 3113
2714	I-2006	ISM 4212
2715	I-2006	ISM 4930
...		

COURSE (COURSE_ID, COURSE_NAME)

COURSE_ID	COURSE_NAME
ISM 3113	Syst Analysis
ISM 3112	Syst Design
ISM 4212	Database
ISM 4930	Networking
...	

REGISTRATION (STUDENT_ID, SECTION_NO, SEMESTER)

STUDENT_ID	SECTION_NO	SEMESTER
38214	2714	I-2006
54907	2714	I-2006
54907	2715	I-2006
66324	2713	I-2006
...		

Some Example Problems

4. Using the relation schemas shown in Problem 3 construct an SQL expression to answer the following queries:

   a) "Which students have an ID number that is less than 50000?"

   b) "What is the name of the faculty member whose ID is 4756?"

   c) "What is the smallest section number used in the first semester of 2001"?

Some Example Problems

4. Using the relation schemas shown in Problem 3 construct an SQL expression to answer the following queries:

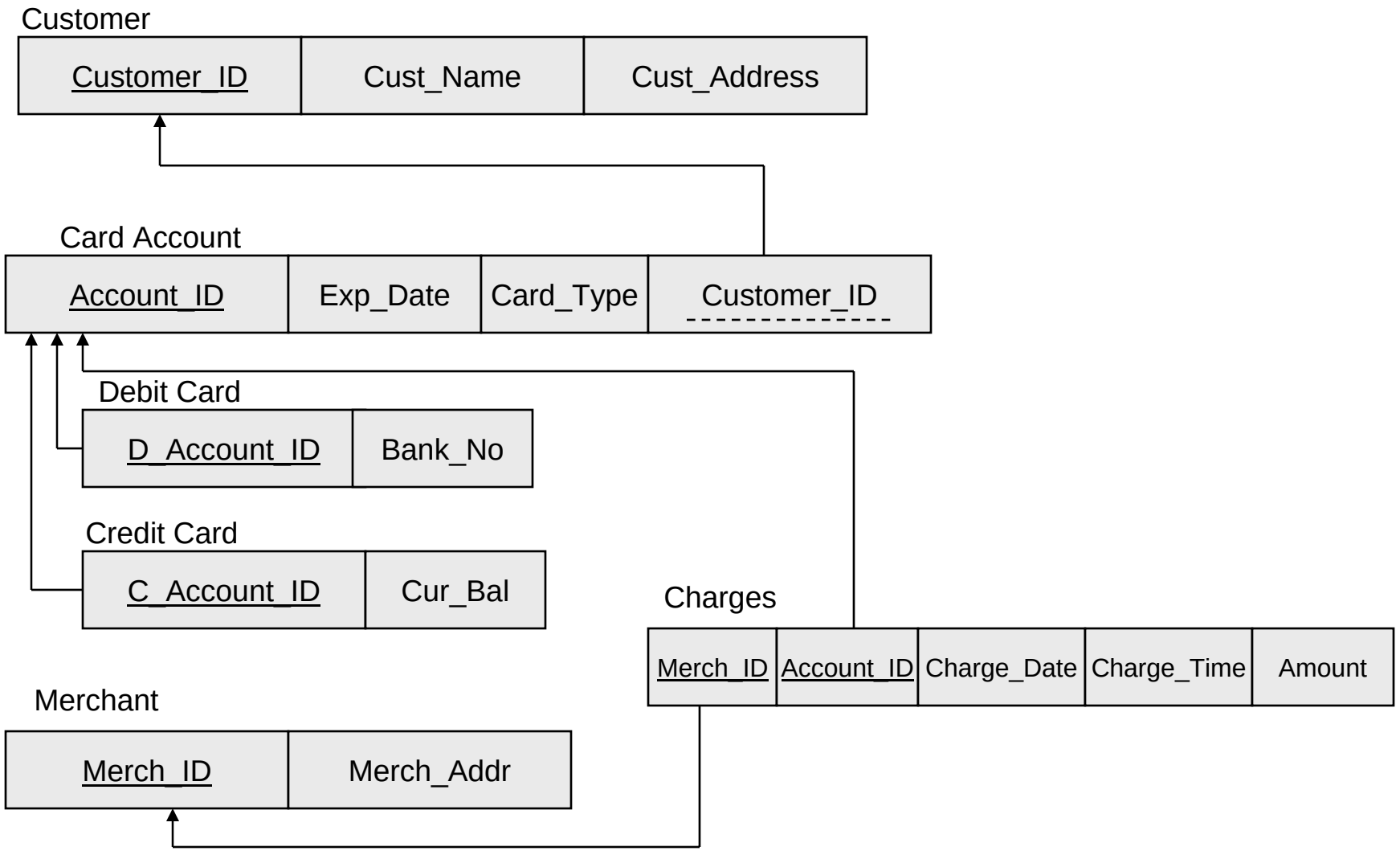
   a) "Which students have an ID number that is less than 50000?"

   b) "What is the name of the faculty member whose ID is 4756?"

   c) "What is the smallest section number used in the first semester of 2001"?

Some Example Problems - ANSWERS

1.



Some Example Problems - ANSWERS

2. The relation scheme CLASS(course_number, section_number, room_number, capacity) is in which normal form given the functional dependency room_number → capacity. If the relation scheme is not in 3NF, decompose it into a set of relation schemas that are in 3NF.

a) 1NF

b) 2NF – since capacity is not dependent on the full set of primary key attributes.

Decompose into CLASS(course_number, section_number, room)

ROOM(room, capacity)

c) 3NF

Some Example Problems - ANSWERS

3.
```
CREATE TABLE STUDENT
        (STUDENT_ID             NUMBER          NOT NULL,
        STUDENT_NAME            VARCHAR2(25),
        CONSTRAINT STUDENT_PK PRIMARY KEY (STUDENT_ID));

CREATE TABLE FACULTY
        (FACULTY_ID             NUMBER          NOT NULL,
        FACULTY_NAME            VARCHAR2(25),
        CONSTRAINT FACULTY_PK PRIMARY KEY (FACULTY_ID));

CREATE TABLE COURSE
        (COURSE_ID              CHAR(8)         NOT NULL,
        COURSE_NAME             VARCHAR2(15),
        CONSTRAINT COURSE_PK PRIMARY KEY (COURSE_ID));

CREATE TABLE SECTION
        (SECTION_NO             NUMBER          NOT NULL,
         SEMESTER               CHAR(7)         NOT NULL,
         COURSE_ID              CHAR(8),
        CONSTRAINT SECTION_PK   PRIMARY KEY(COURSE_ID,SECTION_NO,
                                            SEMESTER),
        CONSTRAINT SECTION_FK FOREIGN KEY (COURSE_ID)
                REFERENCES COURSE (COURSE_ID));
```


Some Example Problems - ANSWERS

```
CREATE TABLE IS_QUALIFIED
        (FACULTY_ID                 NUMBER          NOT NULL ,
        COURSE_ID                   CHAR(8)         NOT NULL,
        DATE_QUALIFIED              DATE,
        CONSTRAINT IS_QUALIFIED_PK PRIMARY KEY (FACULTY_ID, COURSE_ID),
        CONSTRAINT QUALIFIED_FACULTY_FK FOREIGN KEY (FACULTY_ID)
                REFERENCES FACULTY (FACULTY_ID),
        CONSTRAINT QUALIFIED_COURSE_FK FOREIGN KEY (COURSE_ID)
                REFERENCES COURSE (COURSE_ID));

CREATE TABLE IS_REGISTERED
        (STUDENT_ID                 NUMBER          NOT NULL,
        SECTION_NO                  NUMBER          NOT NULL,
        SEMESTER                    CHAR(7)         NOT NULL,
        CONSTRAINT IS_REGISTERED_PK PRIMARY KEY (STUDENT_ID,
                                    SECTION_NO, SEMESTER),
        CONSTRAINT STUDENT_IS_REGISTERED_FK  FOREIGN KEY(STUDENT_ID)
                REFERENCES STUDENT(STUDENT_ID),
        CONSTRAINT COURSE_IS_REGISTERED_FK FOREIGN KEY (SECTION_NO,
                                                        SEMESTER)
                REFERENCES  SECTION(SECTION_ID, SEMESTER));
```


Some Example Problems - ANSWERS

4. Using the relation schemas shown in Problem 3 construct an SQL expression to answer the following queries:

a) "Which students have an ID number that is less than 50000?"

```
SELECT STUDENT_ID, STUDENT_NAME
FROM STUDENT
WHERE STUDENT_ID < 50000;
```

b) "What is the name of the faculty member whose ID is 4756?"

```
SELECT FACULTY_NAME
FROM FACULTY
WHERE FACULTY_ID = 4756;
```

c) "What is the smallest section number used in the first semester of 2001"?

```
SELECT MIN(SECTION_ID)
FROM IS_REGISTERED
WHERE SEMESTER = 'I-2001';
```