# THE AUSTRALIAN NATIONAL UNIVERSITY

*Second Sememester Examination 2008*

# RELATIONAL DATABASES

# (Comp2400/Comp6240)

*Writing period: 50 minutes duration*
*Study period: 10 minutes duration*
*Permitted materials: paper based English/foreign language dictionary*
*Answer all questions.*
*Write your answers on this paper in the spaces provided.*

| | |
|---|---|
| **Name** | |
| **Student Number** | |

Several questions below refer to this database. Primary keys are shown by underlining.

**book**

| **isbn** | **title** | **year** |
|---|---|---|
| 123 | Toaster Maintenance | 1998 |
| 234 | 1001 Sheep Jokes | 2002 |
| 345 | Backpackers Guide to Estonia | 2002 |

**authorship**

| **book** | **author** |
|---|---|
| 123 | Phil Collins |
| 123 | Madonna |
| 234 | James Blunt |
| 345 | Madonna |

authorship(book) references book(isbn)

# Question 1 SQL

## 1. (a)

Use the blank tables provided to give the results of the following SQL queries, including column headings. **[2 marks]**

```
SELECT isbn
FROM book
WHERE year=2002;
```

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

```
SELECT year
FROM book, authorship
WHERE author='Madonna';
```

| | | | |
|---|---|---|---|
| | | | |
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| | | | |

## 1. (b)

Write SQL queries against the database given above, to fulfil each of the following requirements. **[6 marks]**

1. Write an SQL query to list the titles of books published in 2002.

2. Write an SQL query to list the number of authors for each book.

3. Write an SQL query to list the authors whose books were all published before 2000.

# Question 2 The Relational Model

## 2. (a)

Can this database store details of a book with no authors? What about an author who has not written any books? Why or why not? **[2 marks]**

## 2. (b)

How would the DBMS react to the following SQL command, and why? **[2 marks]**

```
INSERT INTO book (isbn, title, year)
VALUES (NULL, 'UML for Wallabies', 2008);
```

# Question 3 UML

## 3. (a)

An art lover wants to record information about paintings that he would like to own, so he can plan his aquisitions.

Each painting has a title and was painted in a given year by a given artist. He is interested in the birth date and country of origin of each artist. Some of the paintings are in the hands of art dealers. The art lover wants to know the name and city of each dealer.

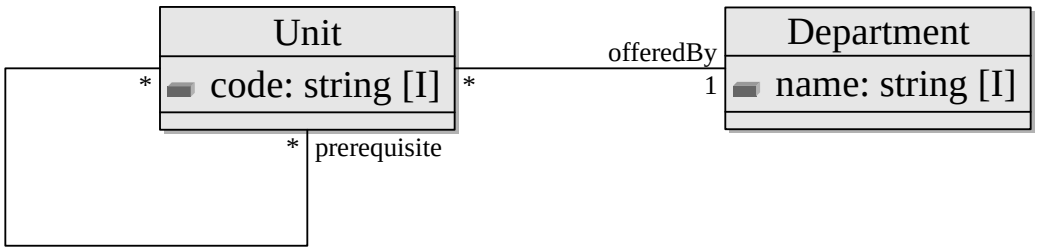
Draw a UML class diagram representing this information. **[3 marks]**

## 3. (b)

Translate the following UML class diagram into SQL `CREATE TABLE` statements to create a database schema. **[3 marks]**

(Example)

```
CREATE TABLE tableName (
    attrib1 type1,
    attrib2 type2 NOT NULL,
    PRIMARY KEY(attrib1),
    FOREIGN KEY(attrib2) REFERENCES otherTable(otherAttrib)
);
```



# Question 4 Relational Algebra and Calculus

## 4. (a)

Evaluate the following relational algebra term in the context of the example database above. Write your solution in the blank table below. **[1 mark]**

$$\pi_{title}(\sigma_{author='JamesBlunt'}(book \bowtie_{isbn=book} authorship))$$

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

## 4. (b)

Write a relational calculus query to list the authors whose books were all published before 2000. **[1 mark]**