

20x

Student Name: \_\_\_\_\_

(print name) \_\_\_\_\_

Student No: \_\_\_\_\_

Hand in your examination paper and your booklet(s).

Do all questions.

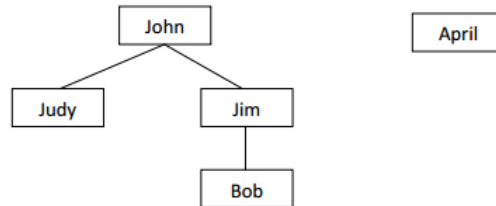
Place answers in the booklet provided.

There are 7 questions and 60 marks.

Where you are asked to show data/rows of a table you may need to make up values of some fields.

1. (5 marks) Answer each of the following:
  - a) True or false: Ralph Kimball invented dimensional modeling.
  - b) What is the major reason for including aggregate schemas in a dimensional model?
  - c) What does the acronym TI-HOBI stand for?
  - d) What are the advantages for including a HOBI in a data warehouse?
  - e) What are the advantages for including a TI-HOBI in a data warehouse?
2. (10 marks) Consider the Section dimension and data in the appendix .
  - a) Illustrate a bit map index for the attribute Science of the Section dimension
  - b) Illustrate a HOBI involving the Section dimension (attributes deptCode and faculty where deptCode rolls up to faculty).
  - c) Augment your answer for b) to include the TI component of a TI-HOBI (use the Day dimension and fields year, month, and day)
3. (5 marks) Consider the Section dimension in the appendix. At times a department is moved from one faculty to another. For example: the Business Administration department started out in the faculty of Arts&Science on Jan 1/2000, but on Jan1/2005 it became part of the faculty of Business. Another example: Anthropology is currently included in the faculty of Science since Jan 1,2000, and it actually does not offer any science degrees. So suppose on Jan 1, 2019 the Anthropology department moves to be part of the Arts faculty. Suppose Bus-1201-001 and Anth-1001-001 have been offered since Jan 1, 2000. Show the contents of Section rows for Bus-1201-001 and Anth-1001-001 if:
  - a. Section is a type 2 dimension
  - b. Section is a type 3 dimension (with respect to the field *faculty*)

4. (10 marks) Consider the data in the appendix for the Student dimension. Suppose students may have a mentor (a mentor is another student who advises the student). Mentoring is a one-to-many recursive relationship. For example, suppose John mentors Judy and Jim, Jim mentors Bob, and April is not mentoring anyone.



- a) Illustrate the Student table augmented for nested sets, and show its contents (i.e. the rows/data) for the above students.
  - b) Illustrate the hierarchy bridge table that would augment the design, and show its contents (i.e. the rows/data) for the above students.
  - c) Write a SQL query to list the first name of the mentor for student with student number 123:
    - a. For the nested sets case of part a)
    - b. For the augmented schema of part b)
  - d) Write a SQL query to show how many students have a mentor who is of the same gender:
    - a. For the nested sets case of part a)
    - b. For the augmented schema of part b)
5. (10 marks) Consider the Registrations Schema in the appendix. There is a problem with the schema since it allows only one book per section. At UWinnipeg each section of a course can have any number of required books.
- a) Show the modified schema. Draw a picture showing tables, relationships, and clearly showing FK and PK fields.
  - b) Given data in the appendix, show the contents (i.e. rows) of the bridge table when we know :

Both ACS-1453-001 and ACS-1453-002 use the text “Exploring Office”.

ACS-1453-003 uses the texts “Exploring MS PowerPoint” and “Exploring MS Word”.

- c) Give an example of a query that would list all departments where the department offers a course using a text written by Jon Smith.

6. (10 marks) Consider the Registrations Schema in the appendix. Note that a registration is paid in a currency. For instance the ACS course 1453 was taken by student 123 who paid €100. Illustrate an Aggregation schema based on the Registration Schema with an aggregate fact table where amounts are aggregated over Day, Currency and Faculty. Each row in the aggregate fact table has two metrics: an amount that is a total, and a count value which is the number of amounts included in the total amount of the row. This Aggregation schema comprises 4 tables.
- Illustrate the Aggregation schema. Draw a picture showing tables, relationships, and clearly showing PKs and FKs.
  - Ignoring the Aggregation schema, a user could write a query to determine the number of payments by currency:

```
SELECT c.symbol, count(amount)
FROM RegistrationFact r INNER JOIN Currency c
ON r.currencyKey = c.currencyKey
GROUP BY c.currencyKey, c.symbol
```

Translate this query to a query that accesses the Aggregation schema only.

- Give SQL statements that create and populate any new tables required for the Aggregation schema.
7. (10 marks) Consider the Registration fact table in the appendix. This fact table contains a field *amount* that is the amount the student has paid for the course taken. Each registration fact references a valid currency (e.g. USDollars, CdnDollars, EuroDollars, etc.) which is the currency the student used to pay for the course.

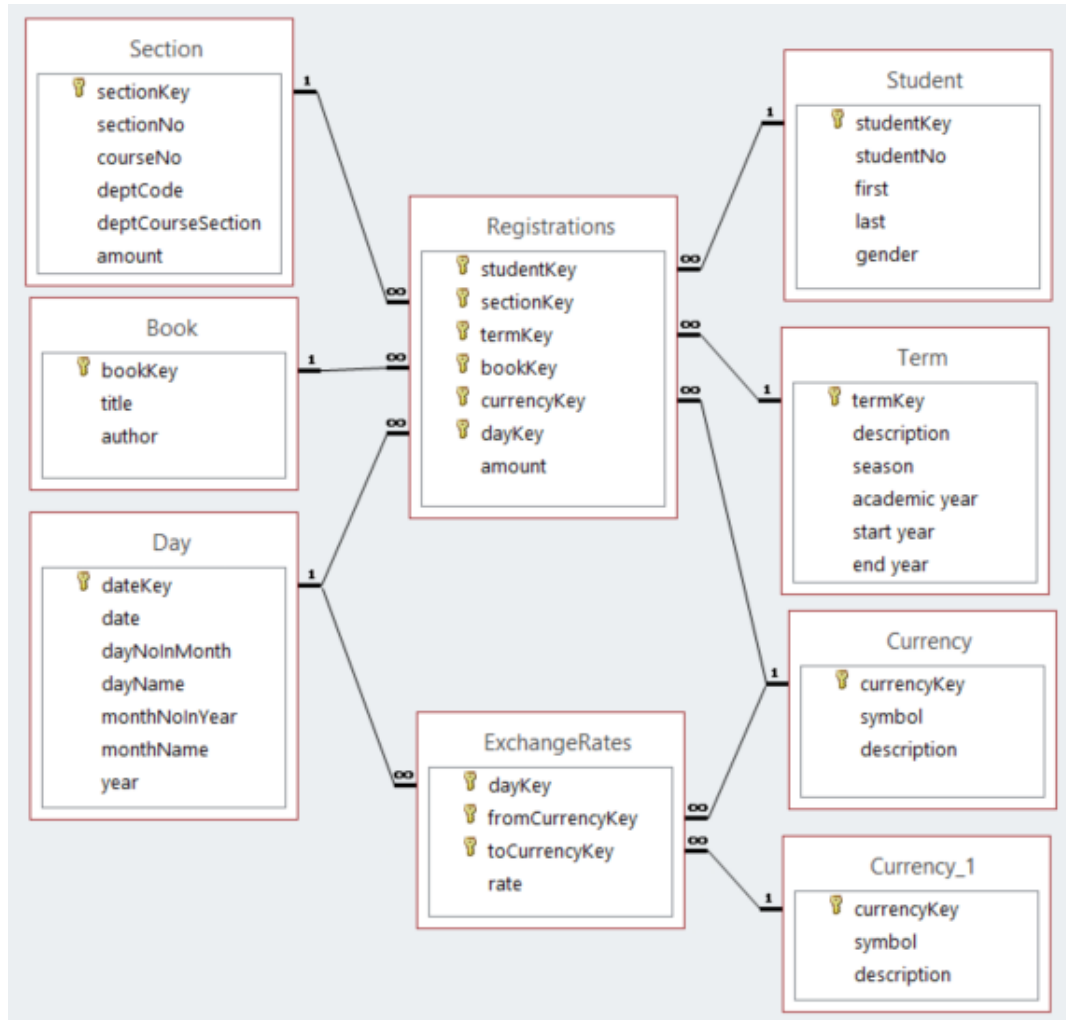
Note also there is a currency exchange rate table that is used to convert a value in one currency into another currency. The Currency schema has an exchange rate for conversions from a currency to another currency for each day in the Date dimension. For instance on Jan 1, 2018 the exchange rate from Swedish Krona to Canadian Dollars was 0.15 which means that 100 Swedish Krona is equivalent to 15 Canadian Dollars. The opposite fact is also present in the Currency schema: 1 Canadian Dollar is worth 6.67 Swedish Krona.

- Write a SQL query to show the exchange rate for converting from £ to € on Jan 1, 2018.
- Write a SQL query that produces the total amount in Canadian Dollars over all registrations in ACS courses. Note that each amount must be converted from its original currency to CanadianDollars.
- Write a SQL query that produces the total of original amounts for ACS registrations for each currency. Each amount is included in exactly one total – the total for its currency. Example of output:

cy	aid in this currency
Pounds	000
ollars	000

<i>y currency is listed in this column</i>	<i>e amounts are the totals paid in £, €, etc</i>
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## Appendix - Schemas



The **Registrations** schema comprises Day, Student, Term, Book, Section, Currency and Registrations.

Registrations contains one row for each registration by a student in a section.

The **Currency** schema comprises Day, Currency, ExchangeRates.

ExchangeRates contains one row for each pair of currencies where rate is the exchange rate converting from one currency to another currency on a specific day.

ExchangeRates includes a row for each currency and day where the *from* and *to* currencies are the same currency where the rate value is 1.

## Appendix: Sample data

Sample data for Student

### Student dimension

studentKey ▾	studentNo ▾	first ▾	last ▾	gender
1	111	John	Smith	male
2	222	Judy	Marshall	female
3	333	Jim	Marshall	male
4	444	Bob	Hogan	male
5	555	April	Porter	female

Sample data for Book

### Book dimension

bookKey ▾	title ▾	author ▾
1	Exploring Office	John Smith
2	Exploring Acces	Bobby Lee
3	Exporingk Powe	John Smith
4	Exploring Word	Bobby Lee