UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

First Year Examination – Semester I – 2017

SCS1103– Database 1

TWO (2) HOURS (For Part A & B)

PART A

To be completed by the candidate

Examination Index No: _____

Important Instructions to candidates:

1. The medium of instruction and questions is **English**.
2. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
3. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
4. Write your index number on each and every page of the question paper.
5. Answer **ALL** questions. There are 02 questions in **Part A** (Question Numbers **1-2** & Page Nos **1 to 7**) and 02 questions in **Part B**(Question Numbers **3-4** & Page Nos **8-14**) of the paper.
6. Any electronic device capable of storing and retrieving text including electronic dictionaries, mobile phones and Calculators are **not allowed**.
7. Write your answers (including diagrams) **in ink**. Use **Black** or **Blue-Black** ink and make sure that your writing is legible.

For Examiner's use only	
Question No	**Marks**
1	
2	
Total	

1)
The scenario given below is to keep track of researchers and their research work.

Researchers are recruited at academic institutions to carry out research projects. Each academic institution has a name, city, and the established year. Each institution may have several schools such as School of Law, School of Business and School of Computer Science. A school belongs to exactly one institution and a researcher who is recruited at a particular academic institution would get attached to a school belongs to that institution.

A researcher can be a lecturer or a research assistant. For each researcher, Employee id, name, year of birth, date joined are required to be managed. The difference between the two researcher categories is that lecturers are permanent and on a salary scale and research assistants are on contract period and has a contract start date, end date and a stipend. There are two kinds of lecturers: senior, and probationary lecturers. Senior lecturers have a seniority grade and only they can be the principle investigators of the research projects. A senior lecturer can be a principle investigator of many research projects. Although a research project can have only one principle investigator at a time, during the period of the research project it is possible to have more than one principle investigator in the event the current investigator leaves the project. Hence start date and end date of each principle investigator with respect to each project is required to be maintained. Moreover, a senior lecturer is able to provide his/her contribution to many research projects as a member of a research group.

Each research project has a title, start date, end date and the total amount of grant money. It is compulsory for a research project to have a principle investigator.

Probationary lectures are required to read for MPhil/PhD and the start date of this degree programme is required to be maintained along with the research title. Each probationary lecturer is supervised by one or more senior lecturers with respect to a particular research project. Each research assistant is also attached to a research project and is supervised by one or more senior lecturers. Researchers publish papers on research projects. It is necessary to keep track of co-authorships, for which researchers have co-authored a research paper, the title, conference and the year.

Moreover, an employment history is required to be maintained for lecturers which includes data on their employments with start date, end date and position with respect to the schools that they have worked or currently working.

(a) Design and draw an ER/EER diagram that captures the information about this scenario indicating primary keys and cardinality constraints/ratios.

[15 Marks]

ANSWER IN THIS BOX

(b) Map the above ER/EER diagram into set of relations identifying the relations, primary and foreign keys. Suggest attributes where necessary for some relations.

[10 Marks]

ANSWER IN THIS BOX

2)

i) Consider that the following two tables are created in the schema 'temp' and the given SQL is executed. The table temp.Customer_Acct has records of all customer accounts and the table temp.Web_Event has records of every web visit.

Customer_Acct(customer_id, customer_name, website)
Web_Event(event_id, customer_id, event_date, channel)

```
SELECT ca.customer_id, ca.customer_name
      FROM temp.Customer_Acct ca
LEFT JOIN temp.Web_Event we ON we.customer_id = ca.customer_id
   AND we.event_date BETWEEN '2017-01-01' AND '2017-06-01'
WHERE we.event_id is NULL
```

Write down in words what is retrieved from the given SQL query and convert it to corresponding relational algebra operation(s). [4 marks]

ii) Consider the following relations to answer questions from (a) to (e):

Student(Sid, Sname, Address, Stream)
Course(Code, Title, Credits)
Registered(Sid,Code)

Write down **the relational algebra expressions** for the queries given below.

a) Retrieve the names of students and the titles of courses that they have registered to. [3 marks]

b) List the names of students who are registered for both 'Database Systems' and 'Analysis of Algorithms' courses. [4 marks]

c) List the course titles for which all students of 'SE' stream have registered [7 marks]

I) with basic and non-basic operation(s).

II) using basic operations only.

d) List the course details of the courses for which there is at least one registered student. No course detail should appear more than once even if there are many students registered for the course.

[3 marks]

e) List the titles of courses for which no student is registered
   - using a join operation.
   - without using a join operation.

[4 marks]