Semester Two of Academic Year (2014---2015) of BJUT

《 Database and Information Systems (COMP2004J)》

Exam Paper A

Exam Instructions：Exam contains 5 questions. Marks will be given for the best 4 questions answered. Each question carries 25 marks.

Honesty Pledge：

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I would accept the punishment thereof.

Pledger：_____ **Class No：_____**

BJUT Student ID：_____ **UCD Student ID_____**

Notes：

The exam paper has 5 questions, 4 questions will be used to calculate the final score, with a full score of 100 points. You are required to use the given Examination Book only.

Instructions for Candidates

The exam contains 5 questions. Marks will be given for the best 4 questions answered.

Obtained score

Question 1:

Based on the following relational schema, answer the following questions:

student(studentNumber, name, major, year)

project(projectNumber, projectName)

assignment(*studentNum*, *projectNum*, task, date)

The assignment relation is used to associate particular students with particular projects in which they will be assigned a task.

a) What is a primary key? For each table, what is the primary key?

(6 marks)

b) Write a query in relational algebra to find the name of every student with the major 'computer science'.

(4 marks)

c) Write a query in relational algebra to find the task assigned to the student with student number 123 on the project with number 456.

(6 marks)

d) Write a query in relational algebra to find the name of every student, the name of the project that they are assigned to and the task that they have to complete.

(9 marks)

Obtained score

Question 2:

Based on the following relational schema, answer the following questions:

student(studentNumber, name, major, year)

project(projectNumber, projectName)

assignment(*studentNum*, *projectNum*, task, date)

The assignment relation is used to associate particular students with particular projects in which they will be assigned a task.

a) What is a foreign key? Identify any foreign keys in the above relational schema?

(6 marks)

b) Write a query in relational calculus to find the major of every student form with the year 2015

(4 marks)

c) Write a query in relational calculus to find the name of every student and the tasks they have been assigned to.

(6 marks)

d) Write a query in relational calculus to find the name of every student and the name of the projects they are assigned to.

(9 marks)

Obtained score

Question 3:

Based on the following relational schema, answer the following questions:

driver(<u>driverID</u>, name, licenceType, age)

car(<u>registrationNumber</u>, model, colour, year)

rental(<u>*driver*</u>, <u>*registration*</u>, date)

a) Write a query in SQL to find the colour of the car with registration number 06-D-64489.

(4 marks)

b) Write a query in SQL to find the number of **different** models of cars that were rented on 01/06/2015.

(8 points)

c) Write a single SQL query to find all of the following information about every driver over 35.

I. Their driverID and Name

II. The number of times they have rented any car

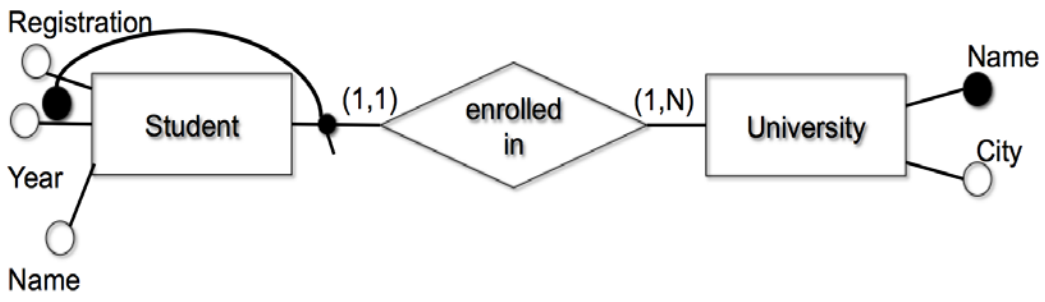
III. The year of the oldest and newest car they have rented

(13 marks)

Obtained score

Question 4:

a) Transform the following entity-relationship diagram into the relational model



(6 marks)

b) Provide an example of an external identifier and its representation in the Entity-Relationship model. The Example should have a definition of the Schema as well as a diagram.

(6 marks)

c) Represent the following scenario (specifying the cardinality of each relationship), using constructs from the Entity-Relationship model:

"Books in a shop have an id number and a price and are printed by one given publisher; each publisher has an identifier, a name and a city".

Translate the Entity-Relationship diagram obtained into the relational model.

(13 marks)

Obtained score

Question 5:

a) Name two database types other than relational databases. How is the data stored in each database? Make reference to the structure of the data and the method of querying the data.

(6 marks)

b) What is a "database link" in a Distributed Oracle Database? Name and describe 3 types of links seen in this system.

(6 marks)

c) What types of anomalies can occur when a "functional dependency" exists in a relation?

(4 marks)

d) The following table is designed to organise data for beer drinking festival:

Drinkers(attendeeID, addr, beersLiked, manf, favBeer)

Each attendee is given an ID and provides an address. After the festival each beer drinker notes the beers which they liked. This information is placeed into the database along with the manufacturers of the beers. The atendees favourite beer is also stored in the database.

I. What is the primary key for the database?

(1 mark)

II. What are the functional dependencies seen in the table?

(3 marks)

III. Decompose the table so that each table conforms to BCNF rules.

(6 marks)