DUBLIN INSTITUTE OF TECHNOLOGY

DT265/1 Higher Diploma in Computing

DT265B Masters Qualifier for MSc in Computing

DT8900/1 International Pre Masters for MSc in Computing

WINTER EXAMINATIONS 2016/2017

INFORMATION SYSTEMS [CMPU4061]]

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THURSDAY 12TH JANUARY 1.00 P.M. – 3.00 P.M.

TWO HOURS

INSTRUCTIONS TO CANDIDATES

ANSWER **TWO** QUESTIONS OUT OF **THREE**.

ALL QUESTIONS CARRY EQUAL MARK

1. (a) A local community library keeps records of current loans of books to borrowers. Each borrower is identified by a borrowerid and each book by a bookid. The name and address of each borrower is held so that communications, such as overdue loan reminders, can be sent when necessary. The information held about books is the title, author's name, year published, publisher's name, purchase price, and number of pages. The library regards a book as only being written by one author, and being published by a single publisher. A book will cover a number of different subjects that the library wishes to record so that borrowers can use an on-line catalogue system to select texts by subject as well as title and author's name. There is a restriction on the number of books a borrower may have on loan at any one time and the loan period. When a book is borrowed, the return date is automatically recorded as the current date. Books out on loan may be reserved by other borrowers pending their return. A special borrower's status flag is maintained – borrowers who hold overdue books or who have reached their loan limit, are flagged to prevent further borrowings.

I. Create an Entity – Relationship (ER) diagram (Diamond notation) to represent the library data requirements described above. State any assumptions you made when creating the ER diagram. Be sure to include attributes as part of your ER design.

(15 Marks)

II. Convert your Diamond notation diagram into a Crows feet notation diagram.

(15 Marks)

III. Write SQL statements to create the tables for each entity

(10 Marks)

(b) "In addition to entities and their inter-relationships, a great deal of additional design information can be inferred from ERDs".

Discuss this statement, using examples from the ERD drawn for part (a) above.

(10 Marks)

2. **(a)** *Database Normalisation* aids the designer in ensuring that the semantically correct attributes are in the correct relations.

Using examples, discuss how normalisation achieves this.

(15 Marks)

(b) A medium-size company with small branches in Dublin and New York is determining the best way to manage its customer and sales data requirements. Both sites have local customers with whom they will be generating sales. The Chief Technology Officer (CTO) for the organisation is assessing the following options:

(i) Local file storage of customer and sales data at each site.
(ii) Local database of customer and sales data at each site.
(iii) Central database of customer and sales data at one of the sites, holding data from both sites.
(iv) Outsourcing of data management to the cloud (i.e. a third party)

Discuss the points that the CTO may raise both for and against each of the above choices.

(25 Marks)

(c) One of the most important functions of a database is to ensure and preserve *Data Integrity*. Consider any two general database topics discussed in class which you feel have relevance to integrity preservation and illustrate how they achieve that goal.

(10 Marks)

3. **(a)** Suppose we have a database structure which consists of the following relations:

ORDER (OrderNumber, OrderDate, CustomerCode)
PRODUCT (ProductNumber, Description, UnitPrice)
ORDERLINE (OrderNumber, ProductNumber, QuantityOrdered)

Write SQL queries corresponding to the following user requirements:

I. Provide a list of product descriptions for those products on OrderNumber 3.

(5 marks)

II. For the customer with CustomerCode 4, list all the orders for that customer along with all the product details.

(5 marks)

III. Assuming it is possible for us to have an order in the system for no products, list the OrdernNumbers for those orders in the system which have no products.

(5 marks)

IV. List the products that have not been ordered at all.

(5 marks)

V. For all orders, display the OrderNumber and the Total Quantity of all products on the order.

(5 marks)

(b) List the *five* classes of DB users, and give a simple explanation of their roles.

(10 Marks)

(c) Give the three phases involved in the development of the "Lifecycle of an Information System". Illustrate your answer with appropriate diagrams.

(15 Marks)