DUBLIN INSTITUTE OF TECHNOLOGY

DT265A/1 Higher Diploma in Computing
DT265C/1 Masters Qualifier for MSc in Computing
DT8265/1 Higher Diploma in Computing
DT8266/1 Masters Qualifier for MSc in Computing

SUMMER EXAMINATIONS 2016/2017

INFORMATION SYSTEMS [CMPU4061]

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MONDAY 22ND MAY   9.30 A.M. – 11.30 A.M.

TWO HOURS

INSTRUCTIONS TO CANDIDATES

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

ALL QUESTIONS CARRY EQUAL MARK

1. (a) Crystal Water Charters is an agency that leases sailing boats to customers for a fee.

Crystal Waters does not own any boats itself, but leases them on behalf of the owners who wish to earn income when they are not using their boats. A description of the operation is as follows:

Each boat may be owned by one or more persons, and any person may have a share in more than one boat. Boats may be leased for varying periods of time (subject to owner agreement), each lease is attributed to a single customer who is ultimately responsible for the boat during the lease period. A customer may of course take out more than one lease. Most boats are leased without crew, however, the agency provides crew for a lease if required, and maintains a record of crew members for this purpose. A crew member may therefore be hired as part of a number of leases, and a lease may include the hiring of one or more crew.

During the time under Crystal Water's care, boats are regularly maintained. A single boat may undergo one or more maintenance services, depending on the length of time it is in the hands of the agency. When a boat is serviced, a record is kept of the repairs and maintenance made and the parts used.

Using the details given in the above statement:

   i.   Create an Entity – Relationship (ER) diagram (Diamond notation) to represent the company 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) *Entity Relational Diagrams* (ERDs) and *Database Normalisation* are two distinct approaches to database design. How in your opinion are they similar and how do they differ?
   (10 Marks)

2. (a) The council library has a number of branches and a number of books at each branch. Each branch has a unique name and location. Borrowers can register with a number of branches and can borrow books from any of these branches. Each book has a unique library code, title, one or more authors, category and publisher. Borrowers have a unique id, name and address. Each book borrowed has to be returned on or before a due date.

The following relations are part of the relational database.
Branch (**Name**, Location)
Book (**ID**, Title, Category, Publisher, DueDate, BorrowerID, BranchName)
Author (**ID**, Name, BookID)
Borrower (**ID**, Name, Address)
The primary key in each table is shown by underlining.

Write expressions in **SQL** to retrieve each of the following:

    I.   Find the author(s) of the book titled 'The Origin of Species'.

(5 marks)

    II.   List all the books written by Milan Kundera and the number of copies of each book held by the library.

(5 marks)

    III.   Find all the books due on or before 31 May 2013 at any branch in Kevin Street.

(5 marks)

    IV.   Find all the books held at the Bolton Street branch which share at least one author with 'Modern Computer Science'.

(5 marks)

    V.   List all borrowers who have borrowed more than 5 books at the moment.

(5 marks)

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

(15 Marks)

(c) How do *views* differ from *base tables* in a relational database? Under what circumstances are views useful?

(10 Marks)

3 (a) Discuss the typical management structure for a computing department within a company.

(20 Marks)

(b) Data stored in a public cloud is often seen as one way small businesses can afford current technology. Discuss the advantages and disadvantages of a small business using a cloud database

(20 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)