INSTITUTE OF TECHNOLOGY

BLANCHARDSTOWN

itb Institute of Technology
Blanchardstown
Institiúid Teicneolaíochta
Baile Bhlainséir

Year	Year 1
Semester	Semester 2 Summer 2009
Date of Examination	Monday 25th May 2009
Time of Examination	12.30pm – 2.30pm

Programme Code	Programme Title	Module Code
BN002	Higher Certificate in Science in Computing in Information Technology	COMP H1029
BN013	Bachelor of Science in Computing in Information Technology	COMP H1029
BN104	Bachelor of Science (Honours) in Computing	COMP H1029
BN997	Student Exchange Course	COMP H1029

Module Title	Databases

Internal Examiner(s):   **Mr Arnold Hensman**

External Examiner(s):   **Dr. Richard Studdert**
Mr. John Dunnion

Instructions to candidates:

1) Question One Section A is COMPULSORY. Candidates should attempt Question One and ANY other <u>two</u> questions in Section B.
2) This paper is worth 100 marks. Question One is worth 40 marks and all other questions are worth 30 marks each.

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SECTION A: COMPULSORY QUESTION

Question 1:   This question is compulsory   **(40 marks)**
Answer **ALL** eight parts.

a) Define the term *Relational Database*. List **four** advantages of relational databases.
                                                                         (5 marks)

b) Describe the terms *Functional* and *Transitive Dependency* in relation to the
    normalisation process of relational database structures.
                                                                         (5 marks)

c) Briefly explain each of the following terms and state what role they play in relational
    databases:

      (i)   Relation
      (ii)   Entity
      (iii)   Attribute
      (iv)   Tuple
      (v)   Relationship
                                                                         (5 marks)

d) Key fields are one of the cornerstones of relational databases. Name and explain
    two different key fields.
                                                                         (5 marks)

e) Define <u>DML</u> and <u>DDL</u> in relation to SQL. Illustrate your answer with **one** example for
    each language.
                                                                         (5 marks)

f) Define the **three** different binary relationship types that are common in relational
    database design. Provide **one** example for each relationship type.
                                                                         (5 marks)

g) Define the term *Referential Integrity*. Provide **one** example where Referential
    Integrity may become advantageous.
                                                                         (5 marks)

h) Using examples, demonstrate the following SQL statements:
    (i) UPDATE statement
    (ii) CREATE TABLE statement
    (iii) DROP TABLE statement
    (vi) SELECT statement
    (v) INSERT statement
                                                                         (5 marks)

SECTION B: Answer any <u>TWO</u> questions

Question 2: SQL   **(30 marks)**

The following tables form part of a database held in a relational DBMS:

- Hotel (<u>Hotel No</u>, Name, Address, City)
- Room (<u>Room No</u>, <u>Hotel No</u>, Type, Price)
- Booking (<u>Room No</u>, <u>Hotel No</u>, <u>Guest No</u>, Checkin_date)
- Guests (<u>Guest No</u>, Name, Address)

Note: the underlined data attributes identify the primary key of each table.

a) Formulate SQL statements to retrieve the following information from the database:

    (i)   List full details of all hotels.
    (ii)   List full details of all hotels in Dublin.
    (iii)   List the names and addresses of all guests in Cork, alphabetically ordered by name and then by address.
    (iv)   List all double or family rooms with a price below £40.00 per night, in descending order of price.
    (v)   List all room numbers that guest number 'G1897' has booked.

                                                                  (10 *marks*)

b) Create SQL statements that create the four tables described above. Make assumptions with regard to domain types. Set primary and foreign keys for each table.

                                                                    (12 marks)

c) Formulate SQL statements to retrieve the following information from the database:

    (i)   Update the price of the Room table so that each double room costs 195 Euro.
    (ii)   List all guest names and the name of the hotel they stayed in.
    (iii)   Show the total number of bookings for each hotel
    (iv)   Show all hotels that have more than 300 rooms

                                                                         (8 marks)

Question 3:   Entity Relationship Modelling

(30 marks)

a) How does an ERD (Entity Relationship Diagram) aid the design of a database?

(5 *marks*)

b) Explain using an example how a *many to many* relationship resolved in Entity Relationship Modelling? Show how you would represent this in an ERD.

(5 *marks*)

c) In a *one to one* relationship how would you decide which entity should receive a foreign key?

(2 *marks*)

d) Is it possible for a table to have multiple primary keys and multiple foreign keys? Explain your answer.

(3 *marks*)

e) Draw an ERD (Entity Relationship Diagram) with fields of your choosing based on the following case study. Ensure that all many to many to relationships are resolved and that all primary and foreign keys are indicated in your diagram.

> *A small adventure holiday company provides packages to its customers through a variety of tours. A tour guide will be assigned to every tour who will accompany that group throughout the duration of the holiday. Flights are also arranged for customers and this is in included in the overall price of the package.*
>
> *In addition to tour guides, the company employs administrators who are responsible for processing customers. Finally, customer may avail of concession tickets that they may have obtained through various sources such as magazines and booking online. These concessions allow a discount from the standard price.*

(15 *marks*)

Question 4:   Transaction Processing

(30 marks)

a) What is a *transaction*?

b) Describe the 3 classical concurrency control problems.

(12 *marks*)

c)

     i.   What is deadlock and how is it detected?

(4 *marks*)

     ii.   How can deadlock be dealt with in a DBMS?

(4 *marks*)

d) Give any three reasons for failure in a database system.

(3 *marks*)

e) Briefly describe any one method of restoring a database that has failed?

(7 *marks*)