INSTITUTE OF TECHNOLOGY

BLANCHARDSTOWN

Year	Year 1
Semester	Semester 2 Autumn 2009 (Repeat)
Date of Examination	**Tuesday 25th August 2009**
Time of Examination	**1.00 pm**

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

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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 two 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) List and briefly explain **five** features of relational databases.

(5 marks)

b) Using examples, demonstrate the following parts of SQL:

(i) WHERE
(ii) ORDER BY
(iii) CONSTRAINT
(iv) GROUP BY
(v) INSERT INTO

(5 marks)

c) Define the terms *NULL Value* and *Entity Integrity*.

(5 marks)

d) Using examples illustrate the following relational database terms:

(i) Primary Key
(ii) Foreign Key
(iii) Composite Key
(iv) Candidate Key
(v) Composite Candidate Key

(5 marks)

e) SQL facilitates the allocation of table constraints. List **five** constraints and illustrate each with **one** example.

(5 marks)

f) List **five** different *Data Types* that are in use with My SQL Server. Provide **one** example for each data type.

(5 marks)

g) Obtaining data from multiple tables requires the implementation of JOINS. List and explain **two** different joins.

(5 marks)

h) Briefly explain what is meant by Disk Mirroring in relation to database technology. Further outline **three** cost/performance trade-offs with the use of disk mirroring.

(5 marks)

SECTION B: Answer any TWO questions

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

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

- Dept (DeptNo, DName, Loc)
- Emp (EmpNo, EName, Job, Mgr, Hiredate, Sal, Comm, DeptNo)
- Salgrade (Grade, Losal, Highsal)
- Job (JobID, JobTitle) – Default value for Job Title is 'To be announced'

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 departments.
(ii) List full details of all employees who work in department number 45.
(iii) List the names and salaries of all employees that are Managers. Order the result in descending order of their salary.
(iv) List the average, minimum, maximum and total salary of all employees in one query. Give all columns suitable names.
(v) List the salary grade of each employee.

(10 marks)

b) Formulate SQL statements to build 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 job title 'Secretary' to 'Personal assistant'.
(ii) Show the total amount of Salaries for each department.
(iii) Show the department name, employee name and the job title of each employee. Order the result in alphabetical order of employee name followed by the job title.
(iv) Add the data attributes 'Address1' and 'City' to the employee table. Select a suitable domain type.

(8 marks)

Question 3: Entity Relationship Modelling

(30 marks)

a) Give three reasons for the importance of good database design.

(3 *marks*)

b) What is a recursive relationship? Explain using an example how this might be represented in an ERD.

(2 *marks*)

c) Describe the three kinds of anomaly that may occur in a database.

(6 *marks*)

d) How may these be avoided? Give a small example.

(4 *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 driving school provides courses to students which may come in a variety of options. Students may take courses consisting of at least three lessons ranging from a six week course of 2 lessons per week to an intensive weekend courses. A course may also be tailor made consisting of any number of lessons desired by the student. A student may take several courses at the school.*
>
> *The driving school employs both instructors and administration staff. Administrators are responsible for the day to day running of the office as well as processing new students and assigning instructors to them. Students have the option to change their instructor midway through any course.*

(15 *marks*)

Question 4: Transaction Processing

(30 marks)

a) Describe the ACID properties in a *transaction*?

(8 *marks*)

b) What are the two phases in two phase locking?

(4 *marks*)

c) What is the difference between a shared lock and exclusive lock?

(4 *marks*)

d) What is meant by the term Serialisation of Transactions?

(4 *marks*)

e) Describe the various levels of granularity of locking?

(10 *marks*)