CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Summer Examinations 2011

Module Title: Database Design & Programming

Module Code: **SOFT 7002**

School: Computing and Mathematics

Programme Title: Bachelor of Science in Information Technology Support – Year 3
Bachelor of Science (Honours) in IT Management – Year 2

Programme Code: **KITSU_7_Y3**
KITMN_8_Y2

External Examiner(s): **Mr. Aidan Quilligan**
Internal Examiner(s): **Mr. Byron Treacy**

Instructions: **Answer all questions. Internal choice in questions 2 and 3.**

Duration: 2 Hours

Sitting: Summer 2011

Requirements for this examination:

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.
If in doubt please contact an Invigilator.

Q1. Database Design 40 Marks

Database design: normalisation:

You are to design a database for a company purchase requisition management system. A requisition is a list of items to purchase.

- The company has a number of staff members.
- Staff members make requisitions for particular items from time to time
- The employees are given unique staffIds. The system stores the staff name, address and phone extension for the employees.
- The date of each requisition is recorded (as is the Staff member who made the requisition).
- Each department has a name (A,B,C etc) and a budget and administrator (admin). Each admin is a staff member so values in that column will be staff id values. Dept B currently has no admin assigned.
- For each requisition the list of items to purchase is recorded; each item has a set description and cost associated with it. NB. Descriptions are simple text fields, not reusable objects, e.g. I1 on R121 is Pens, but I1 on R125 is a Fan.

Requisition

StaffID	Name	Dept	Address	PhExt	ReqNo	Item	Desc	Cost€	Date	Admin	Budget
132	Smith.J	A	Douglas	445	R121	I1	Pens	20	12/12/09	132	12000
132	Smith.J	A	Douglas	445	R125	I1	Fan	90	3/3/10	132	12000
145	Treacy.B	B	Cobh	666	R200	I1	Mouse	20	2/5/2011		9500
145	Treacy.B	B	Cobh	666	R200	I2	Disk	100	2/5/2011		9500
132	Smith.J	A	Douglas	445	R125	I2	RAM	50	3/3/10	132	12000

Note: you should have enough information to make a design but if you are confused about any aspect of the problem, discuss the confusing issue(s) and then proceed with a design.

a) Define a set of functional dependencies for the above application.
b) Define a primary key for the requisition table above.
c) Describe 3 **processing anomalies/problems** that may arise with the above requisition table i.e. 1 Insert, 1 update and 1 delete problem.
d) Use normalisation to make a new design for the application that adheres to at least 3NF.
e) Define primary keys in the new tables.
f) Devise a UML diagram to model the above requisition system.

Q2. SQL: Database Manipulation (Answer 2 of 3) 30 Marks

Using the Project Management database described below, answer the questions following

STAFF (**SNo**, SName, Sec_level, Address, Salary)
JOB(**JNo,** Role, Skill_Level)
PROJECT(**PNo,** Pname, Budget, StartDate, Pstatus)
WORKS(**SNo, PNo, JNo,** Attitude)

Keys: underlined and in bold print.

Staff have a security clearance level and have a basic salary. Projects have a initial Budget, start date and current status (Active; On-Hold; Pending; Over). You can work on the same project in different Job roles e.g. act as designer and programmer on one project. Also you can work on different projects in the same job role e.g. admin on a number of projects.

JOB

JNo	Role	Skill_Level
J1	Admin	Low
J2	Designer	High
J3	Programmer	High
J4	Admin	HIgh

Project				
PNo	Pname	Budget	StartDate	Pstatus
P1	Air Lingus	10000	02/04/2008	Active
P2	Guinness	150000	02/06/2007	Pending
P3	EMC	125000	08/09/2007	Over
P4	CIT	11110	1/1/2010	Active

Staff				
SNo	Sname	Sec_level	Address	Salary
S1	Smith	20	London	50000
S2	Jones	10	Paris	65000
S3	Blake	20	Paris	28000
S4	Clark	30	London	32000
S5	Adams	30	Athens	24000

Works			
Sno	Pno	Jno	Attitude
S1	P1	J1	Good
S1	P1	J4	Bad
S2	P2	J1	null
S2	P3	J2	Excellent
S2	P3	J3	Bad
S2	P3	J4	Good
S3	P3	J1	Bad
S5	P1	J4	Bad
S5	P4	J2	Excellent

Q2. Answer 2 of the following **30 Marks (2 * 15)**

2.1 Find the names of staff that have worked on more than one project.

2.2 Find the names of staff that work in admin roles on projects that have a budget more than 100,000

2.3. Date data type:

- Write a note on the Date data type, and
- Explain why dates are important from a programming (SQL) perspective.
- What is a dialect (in relation to SQL) and explain how Date data types are linked to Dialect?

Q3. General Concepts: (Answer 2 of 3) **30 Marks (2 * 15)**

3.1 Database Design: UML V's Normalisation: Describe and contrast the two approaches to database design.

3.2 Btrees & Indexing:

- Explain how a Btree can be an index only or a full data file organsiation?
- Explain what is meant by a balanced Btree?
- Explain why Balanced Btrees offer good performance?

3.3 Database Systems Management Systems (DBMS) were developed to manage the data definitions used in an application.

- What are the benefits of centralised management of data definitions?
- DBS control (i.e. constrain) data definition in different ways. Using your experience of database table definition (i.e. the SQL Create table command), explain the different controls (constraints) that DBS designers can place on data.
- Comment on why these control/constraints are advantageous? i.e. why place all these constraints on data?