

## Wednesday, 29 April 2009 9.30 am – 11.30 am (Duration: 2 hours)

DEGREES OF MSc in Information Technology MRes in Bioinformatics

## **INFORMATION SYSTEMS AND DATABASES (M)**

Answer Question 1 in Section A and Two Questions from Section B

This examination paper is worth a total of 70 marks

You must not leave the examination room within the first hour or the last halfhour of the examination.

## Section A

1. Take two of the following eight topics and write a short description with examples:

1

- (a) The use of styles in word processing.
- (b) Cell formatting in a spreadsheet.
- (c) Relative and absolute addressing in a spreadsheet formula.
- (d) Colour
- (e) Haptic user interfaces and their use.
- (f) MIME types
- (g) Core attributes in XHTML.
- (h) Lookup functions in spreadsheets.

[5 marks each]

## Section B

2. (a) Describe how fan traps and chasm traps cause modeling problems in ER diagrams.

[4]

(b) Create an ER diagram from the following specification:

A food market is made up of a set of numbered stalls, each with a title, a size and a set of specialities (vegetables, meat, etc.). The stalls buy food from farms, which have a name and an address by making orders each of which is for a particular quantity of a certain foodstuff. Each stall has several employees, one of whom is identified as the stall holder and each of whom is numbered using a numbering system which is the same for each stall - i.e. each stall has employee 1, employee 2, etc. The name and age of each employee is recorded.

[11]

- Compare the use of binary search over ordered data with the use of hash functions (c) to find records efficiently.
- (d) Describe two problems which might arise if there was no control over the concurrent access to data by multiple users.

[5]

[5]

(e) Describe the concept of **isolation** to deal with these problems and give situations in which different isolation levels would be used.

[5]

3. The following relational database is used within a library. The Borrows table contains only the currently active loans. A few of the records in each table are shown.

ubranch

5

6

5

6

ł	BOOK
t	itle

title	author	access#	branch#	••
Emma	Austen	501	5	Uses
Dracula	Stoker	502	5	user
Justine	Durrell	503	5	701
Kim	Kipling	504	6	703
	1 0	1	11	704
				704

BORROWS			
book#	reader#	dueDate	
501	702	01-MAY-2009	
503	703	12-MAY-2009	
504	703	25-APR-2009	

BRANCH			READER			
bName	address	br#	rName	address	ticket#	dateOfBirth
Hillhead	31 Byres	5	T Black	12 Oak Ave	701	15-MAR-1944
Partick	874, Dum	6	A Gray	5 High St	702	null
			M Jones	1 High St	703	19-JUN-1978

	The forei	gn keys are as follows:				
	Book.branch# refers to Branch.br#					
	Borrows.book# refers to Book.access#					
	Borrows.reader# refers to Reader.ticket#					
	Uses.user refers to Reader.ticket#					
	Uses.ı	Uses.ubranch refers to Branch.br#				
(a)	Give SQ	L and relational algebra queries to retrieve the following:				
	(i)	the names of all the readers and authors in one query;	[2]			
	(ii)	the address of the reader who has borrowed the book 'Justine';	[4]			
	(iii)	the names of readers who do <b>not</b> use branch 5.	[6]			
(b)	Give SQ	L queries to achieve the following:				
	(i)	Return the branch names and the number of users of each branch.	[3]			
	(ii)	Move the book 'Emma' to branch 6.	[1]			
	(iii)	Remove branch 6 and all of its users and books.	[2]			

2

Summer Diet

3

(c) Describe the use of **null values** in a database including reasons why they might be needed and anomalies which might arise when querying a table with null values using the database above as an example.

[5]

(d) Give one **constraint** for the database that can be asserted when creating the tables and another constraint which could only be asserted in a program managing the database.

[3]

(e) Describe the way in which distributed databases commit their data.

4

[4]

4. (a) To what extent can a spreadsheet program be said to provide database functions?

[4]

(b) Given the following ER diagram, produce a **relational schema**, indicating the primary keys and the foreign keys:

[10]



(c) A schema for a database holding information books, publishers and authors is given below:

Book(<u>ISBN</u>, title, price, pubid)

Author(<u>auID</u>, aname, nationality, gender)

Publisher( pubID, pname, phone, address )

WrittenBy( ISBN, auID)

Suggest the **functional dependencies** that are implied by this schema.

[2]

(d) Show the two **tables** that would be created by (i) the inner join of *Book* and *Publisher* and (ii) the inner join of *WrittenBy* and *Author*. State which **normal form** each of these is in, justifying your answer with a reason and giving some update anomalies that might occur if these were used as the base tables.

[6]

(e) The publishers want to have the ability to assign more than one price to a book for different types of sale. What **changes** need to be made to this **schema**?

[2]

(f) Using pseudo-code, show how a web site program makes use of data submitted through **XHTML forms**.

[6]

Summer Diet