

UNIVERSITY OF LONDON

BSc Mock Examination 1998/1999

COMPUTING AND INFORMATION SYSTEMS

CIS209

Database Systems

Duration: 3 hours

Date and time:

This paper is divided into four parts, from Part A to Part D. **All parts are compulsory.** However, read the instructions for each part, carefully, because you are **advised to attempt less questions than provided.** If you choose not to follow these instructions and attempt more questions than advised, you might not be able to finish your paper because of lack of time.

You do not need to use electronic calculators for this assignment, therefore they are not allowed.

***THIS MOCK EXAMINATION PAPER MUST NOT BE REMOVED
FROM THE MOCK EXAMINATION ROOM.***

Part A

Attempt **four** of the following six problems

Problem 1. Select and briefly explain three limitations of the file based approach that are resolved by the database approach.

Problem 2. Define the concepts of *database* and *database management system*.

Problem 3. Enumerate and briefly explain (1-3 sentences) five features of a DBMS.

Problem 4. Define the concepts of *candidate key*, *primary key* and *alternate key*, and give examples.

Problem 5. Explain the mechanisms of maintaining referential integrity based on foreign keys (foreign key rules), considering that null values are not allowed.

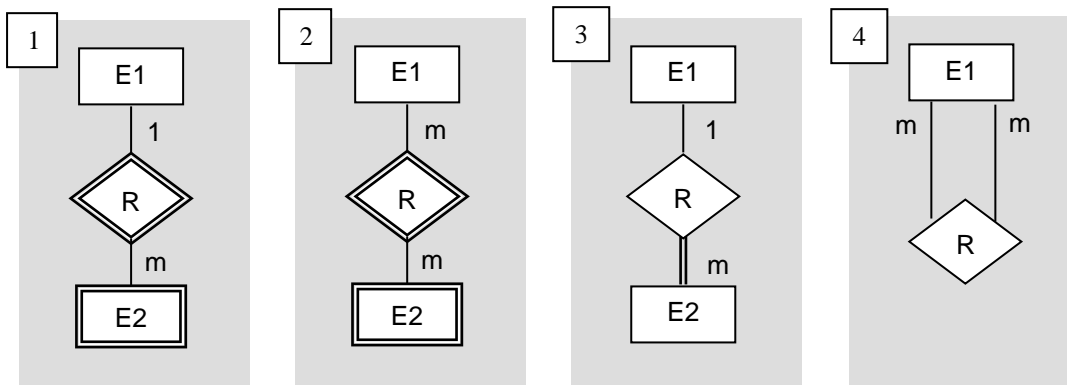
Problem 6. What mappings have to be made between the three levels of the ANSI / SPARC architecture and what is achieved by each?

Part B

Attempt **three** of the following four problems

Note that for this mock examination paper the following problems might not be properly "balanced", in that some of them might require more effort than the others. This is not going to be the case for the real examination paper.

Problem 1. Provide (real life) examples for the following E/R diagrams (and short explanations):



Problem 2. Find and explain all functional dependencies in the following example and draw the corresponding dependency diagram (example taken from "An introduction to database systems", C.J. Date, 1995). State the semantic assumptions that you make. Try to be as realistic (as close to the real life situation) as possible. For example (semantic assumption), a customer can have more than one "ship-to" address.

A database is to be designed for an order-entry system. The information it has to contain is about customers, items and orders. The following information is to be included:

- for each customer: customer number, "ship-to" addresses, balance, credit limit, discount;
- for each order: heading information - i.e. customer number, "ship-to" address, date of order - and detail lines - item number, quantity ordered;
- for each item: item number, manufacturing plants, quantity on hand at each plant, stock danger level for each plant, item description.

For internal processing reasons, a "quantity outstanding" value is associated with each detail line of each order. This value is initially set to the quantity of the item ordered and is (progressively) reduced to zero as shipments are made.

Problem 3. Consider the table in Figure 1. Provide examples of insertion, deletion and update anomalies. State the semantic assumptions you made.

Staff_no	Doctor_name	Speciality	Patient_no	Patient_name	Problem	Appointment	Surgery_no
S1001	Linus Lincoln	dentist	P213	Max Burns	bridge	11/03/99, 10:15	D12
S1001	Linus Lincoln	dentist	P222	Phil Collin	onlay	11/03/99, 10:15	D13
S1001	Linus Lincoln	dentist	P222	Phil Collin	ache	10/03/99, 8:00	D12
S2001	Helen Clinton	GP	P111	Jack Dean	stomach	14/03/99, 12:00	G100
S2001	Helen Clinton	GP	P213	Max Burns	head	17/03/99, 12:00	G100
S3001	Lucy Kennedy	heart-spec	P213	Max Bunrs	heart	17/03/99, 12:30	G100

Figure 1

Problem 4. Describe the process of normalising the table in Figure 1 (above) up to 3NF or BCNF. State the semantic assumptions you made.

Part C

Attempt **one** of the following three problems

Note that for this mock examination paper the following problems might not be properly "balanced", in that some of them might require more effort than the others. This is not going to be the case for the real examination paper.

Problem 1. What is a view? Discuss the differences between a view and a base relation. Explain what happens when a user accesses a database through a view. (problem taken from "Database systems: a practical approach to design, implementation and management", T. Connolly and C. Begg, 1999)

Problem 2. Describe and compare the two main approaches to data security.

Problem 3. Illustrate the two uncommitted dependency problems.

Part D

Attempt **one** of the following four problems

Note that for this mock examination paper the following problems might not be properly "balanced", in that some of them might require more effort than the others. This is not going to be the case for the real examination paper.

Problem 1. Define and explain / illustrate the following OO concepts: encapsulation, information hiding, methods and messages, classes and instances.

Problem 2. Choose and explain / illustrate five advantages of OO databases.

Problem 3. Explain how domains in a relational model can be viewed as corresponding (implementing) objects in an OO model.

Problem 4. Explain the difference between rules and integrity constraints with relation to a deductive database and illustrate some approaches to constraint enforcement.