COMP23111

Two hours

Please note that an OMR Sheet is attached for use with Section A:
full instructions for their use are given in Section A

QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAM ROOM

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Fundamentals of Databases

Date: Friday 21st January 2011

Time: 14:00 - 16:00

The Paper is in THREE Sections

Section A is compulsory set of 20 Multiple Choice Questions

Section A Questions 1-10 achieve 0.5 marks each
Section A Questions 11-20 achieve 1.0 marks each
Incorrect answers achieve 0 marks

You should also answer ONE conventional exam style question worth 20 marks from either Section B or Section C

Please use separate Answerbooks for EACH Section

The total examination mark is out of a possible 35

This is a CLOSED book examination

The use of electronic calculators is NOT permitted

SECTION A

Answer ALL Questions on the sheet provided
The Question Paper must be returned before you leave the examination.

Each Question has exactly one correct answer, and should be answered by clearly marking a horizontal line within the square brackets next to the letter (A, B, C, D or E) on the answer sheet provided.

Section A is a multiple choice section and is therefore restricted

[PTO]

SECTION B

B. a) With regard to Database Management Systems:

i) Explain what is meant by a database management system, and contrast it with a File Management System.

(2 marks)

ii) Recovery is an important function of a Database Management System, which is also of interest to Database Administration. Various facilities can be provided to aid this function. Explain what these facilities are and provide two examples of facilities related to the Recovery function.

(2 marks)

b) What are the main advantages and disadvantages of SQL? Use examples to link your discussion to ways of enforcing data integrity in SQL.

(5 marks)

c) Represent each of the following requirements with an ER diagram:

i) A company called Perfect Pets runs a number of clinics. A clinic has many staff and a member of staff manages at most one clinic (not all staff manage clinics). Each clinic has a unique clinic number (clinicNo) and each member of staff has a unique staff number (staffNo).

(2 marks)

ii) When a pet owner contacts a clinic, the owner's pet is registered with the clinic. An owner can own one or more pets, but a pet can only register with one clinic. Each owner has a unique owner number (ownerNo) and each pet has a unique pet number (petNo).

(2 marks)

iii) When the pet comes along to the clinic, it undergoes an examination by a member of the consulting staff. The examination may result in the pet being prescribed with one or more treatments. Each examination has a unique examination number (examNo) and each type of treatment has a unique treatment number (treatNo).

(3 marks)

d) This question requires you to think across sections of the course or about information you have not been formally taught. An Entity Relationship (ER) Diagram is the standard method of modelling entities and relationships for database creation. What other diagramming techniques could be used to model these entities and relationships? Are ER Diagrams suitable for modelling Object Oriented Databases? Justify your answer. Can you fully describe a database using ER modelling?

(4 marks)

[PTO]

SECTION C

C. a) Select the most appropriate File Organisation for each of the following situations, and explain your choice in each case.

i) Situation 1: The relation to be stored in disk has an index key as additional access structure. (2 marks)

ii) Situation 2: The relation to be stored in disk is always accessed as a whole, i.e., every tuple in the relation is retrieved every time the relation is accessed. (3 marks)

iii) Situation 3: The access order of the individual tuples of the relation to be stored in disk is random and it is always based on the same field. (3 marks)

b) Describe the following:

i) What an index is and what it is for. (1 mark)

ii) Each of three different types of single-level index. (2 marks)

iii) An example for one of the types of single-level index (by illustration, and specifying the index type you are illustrating). (1 mark)

iv) What a multi-level index is, in which circumstances it should be used, and how it reduces the search effort for a tuple. (2 marks)

v) An example of a multi-level index (by illustration). (1 mark)

c) This question requires you to think across sections of the course or about information you have not been formally taught. There are 4 main ways of increasing the performance of a database.

i) What are these? (1 mark)

ii) How do any of them relate to normalisation? (1 mark)

iii) How could these performance increases relate to database block structure? (1 mark)

iv) From your experience of the real world, when would you use hashing and indexing? (2 marks)

END OF EXAMINATION

The Question Paper must be returned before you leave the examination