UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION, 2006

Title of Paper   :   Databases and their Design

Course Number   :   CS 340 (I)

Time Allowed   :   Three (3) Hours

Instruction   :   Answer **ANY FIVE** questions

This paper should not be opened until permission has been granted by the invigilator.

Question 1

(a)   Differentiate between a database and a database management system.   [4]

(b)   Briefly describe, with the aid of an example, redundancy and the problems associated with it.   [6]

(c)   Why is it necessary to specify integrity constraints when designing a database.

    [4]

(d)   Briefly describe the three main data models.   [6]

Question 2

(a)   What are the advantages of the network model over the relational data model? What are the disadvantages?   [5]

(b)   How can a network that is not a perfect tree be implemented by means of a hierarchical model DBMS?   [4]

(c)   Briefly describe abstraction and its importance/advantage as enjoyed by databases.

    [2]

(d)   Describe the levels of abstraction of a database.   [9]

Question 3

(a)   Differentiate between an entity set and a relationship set.   [4]

(b)   Banks keep accounts for their customers. For each customer they record the customer name, graded tax number, address; each account is associated with an account number and a balance.
     (i)   Draw an ER diagram to relate a customer to an account with an appropriate relationship set of your choice.   [8]
     (ii)   Extend the ER diagram using the entity set transaction. For each transaction banks would record the transaction number, the date and the amount in question.
    [8]

Question 4

(a)   Why is an ER diagram desirable?   [5]

(b)   In the student database fo the University of Essex, each student is identified with a name, year of registration and an Id. A student can either be an undergraduate or a postgraduate student. Each undergraduate student does two subjects: one major and one minor; all postgraduate students do research – identified by a title.

    This database lends itself well to the concept of generalisation. Use this example to illustrate and fully describe generalisation.   [15]

Question 5

One of the UniSwa databases is such that each student is identified with a stud_id, stud_name, and a year of registration. The students enroll in certain courses. Each course has a crse_numb, crse_name, and a crse_id. The courses are taught by lecturers. Each lecturer has a lect_id, lect_name, and owns a particular office. The courses are taught in some given rooms. At the end of year each course in which a student enrolled in must have a mark for that particular course.

(a)   Illustrate this database by means of an ER diagram   [10]

(b)   Translate the above ER diagram into tables; identifying primary keys for each table.
                                                                                                                          [10]

Question 6

(a)   (i)   What is a view?   [2]
                  does the data described in a view ever exist in that form?   [2]

(b)   Define a view called CUSTORD (Customer Order). It consists of the customer number, name, (both from CUSTOMERS); balance, (from BALANCES); order number, and order date (both from ORDERS_PLACED), for all orders currently on file.

        (i)   Write the view definition for CUSTORD.   [5]
        (ii)   Write an SQL query to retrieve the customer number, name, and order date for all orders in CUSTORD for customers whose balance is more than E100.   [5]
        (iii)   Convert the query from (ii) to the query that will actually be executed.
                                                                                                                          [6]