

# UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

*DEPARTMENT OF COMPUTER SCIENCE*

**SUPPLEMENTARY EXAMINATION, JULY 2012**

Title of Paper : Databases and their Design I  
Course Number : CS 345  
Time Allowed : Three (3) Hours  
Instruction : Answer any **FIVE** questions

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

### Question 1

- (a) Define the following terms:
- (i) Data [2]
  - (ii) Database [3]
  - (iii) DBMS [3]
- (b) The advantages of a DBMS include: increased productivity, data independence, data abstraction, and controlled/eliminated redundancy.
- (i) What is meant by data abstraction and how is it an advantage? [4]
  - (ii) How is productivity increased? [4]
  - (iii) How is data independence an advantage? [2]
- (c) MMM Ltd has an unlimited budget for its IT section. Regardless of the unlimited budget and of course the vast advantages of using DBMSs, there is an instance where it would not be advisable for MMM Ltd to use any DBMS – what circumstances would these be and why? [2]

### Question 2

Users involved in a database include a DBA, database designers and end users.

- (a) Differentiate between a DBA and a database designer. [4]
- (b) End users include naive (parametric) end users
- (i) Describe a naive end user with the aid of an example. [4]
  - (ii) Compare and contrast the other two categories of an end user. [5]
- (c) If MMM Ltd, in question 1(c), is advised to embark on a project of mounting a DBMS to manage their databases:
- (i) What would be your job if you were hired as a systems analyst? [3]
  - (ii) How about if you were an application programmer? [4]

### Question 3

- (a) Data abstraction can be done to three main levels and so is the number of main groups of data models. Choose any one of these two groups of three and write briefly about them. (No more than a page). [9]
- (b) Define a relational database and an un-normalised relation. [5]
- (c) Give the formal names of a record, file, and a field. [3]
- (d) Describe the shorthand representation of the structure of a relational database. [3]

### Question 4

- (a) What does it mean to qualify a name of an attribute? How is this done? [3]
- (b) Give three advantages of the relational database and two disadvantages. [5]
- (c) What is the relationship between the network model and the CODASYL model [3]
- (d) Describe briefly how a network model, that is not purely hierarchical, can be implemented by means of a network. [5]
- (e) What are the advantages of the hierarchical model as compared to the other two models? What are the disadvantages? [4]

Question 5

- (a) Define the following two sets with examples (at least two elements in each set)
  - (a) Entity set [2]
  - (b) Relationship set [2]
  
- (b) Draw an E-R diagram for a banking enterprise with two entity sets, CUSTOMER and ACCOUNT: where each customer has a name, graded tax number and an address; an account can either be a current account or a savings account, and has a balance and account number. Find and place a meaningful relationship between these two entity sets. [6]
  
- (c) Define a primary key and, with the aid of a diagram, define existence dependence. [4]
  
- (d) Describe generalisation with the aid of a diagram (NOT using a banking enterprise example). [6]

Question 6.

Consider an ordinary university setting (that will have lecturers, courses, programs, etc).

- a) Use the fact that a course taught by a lecturer will be offered in a particular semester (term), hence the concept of *taught* and *offered* are addressing the same issue, to describe aggregation. Draw an E-R diagram to illustrate your description. [10]
  
- b) Reduce the E-R diagram in (a) into tables. [10]