

# UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

*DEPARTMENT OF COMPUTER SCIENCE*

**MAIN EXAMINATION, DECEMBER 2011**

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) Compare and contrast data and information. [4]
- b) Define a database and state how it differs from a DBMS. [4]
- c) Briefly discuss the three main types of actions involved in databases. [4]
- d) In a school database with entities such as STUDENT, COURSE, PREREQUISITE, RESULT; what constraints do you think should hold in such a database? [4]
- e) Discuss any two types of end users and their main activities. [4]

### Question 2

- a) Discuss physical data independence and logical data independence and their importance. [4]
- b) How does consistency result from controlling or eliminating redundancy? [3]
- c) Briefly describe data abstraction and its advantage as enjoyed by databases. [3]
- d) How is the complexity of a DBMS a disadvantage. [5]
- e) Draw an ER diagram to represent the database described in 1. (d) above, adding at least two more entities of your own. [5]

### Question 3

- a) Discuss the strengths and weaknesses of a DBMS in terms of its security. [2]
- b) A company TT Motors services vehicles and has a number of branches around the country. These vehicles are either light duty or heavy duty vehicles that are both serviced alternatively between major service and minor service. In other words if a vehicle does a major service now, next time it will do a minor service. A truck would be an example of a heavy duty vehicle and a BMW 525i would be a light duty vehicle. Considering Service, Vehicle, Branch, etc as entities. Extend this database by at least 4 other entities and draw an ER diagram to illustrate it. [12]
- c) Break down the above E-R diagram into tables. [6]

#### Question 4

- a) Define a data model and state what designers use it for. [4]
- b) How is a network model related to a CODASYL model? [4]
- c) What is a relationship within a relational database? [3]
- d) Discuss the advantages and disadvantages of the network data model over the hierarchical data model. [4]
- e) Describe how a network model, that is not purely hierarchical, can be implemented as a hierarchical model. [5]

#### Question 5

Consider the following database schema:

**EMPLOYEE** (F-name, L-name, Pin, B-Date, Sex, Salary, Super-Pin, D-no);  
**DEPT** (D-name, D-no, Mgr-Start-Date);  
**DEPT-LOCATION** (D-no, D-Location);    **WORKS-ON** (E-Pin, P-no, Hours);  
**PROJECT** (P-Name, P-no, P-Location, D-no, Status);  
**DEPENDENT** (E-Pin, First-Name, Sex, B-date, Relation).

Specify relational algebra queries to:

- a) Retrieve the names of employees in department 3 who work on project 2. [3]
- b) List the names, surnames and the relationship thereof the employees who share their first names with their dependents. [3]
- c) Compute the number of projects which are currently running. [3]
- d) Retrieve the names of employees who do not work on any project. [4]
- e) Retrieve the average salary of all male employees in department 5. [3]
- f) For each department, give the name and pin of the manager and the location of the department. [4]

**Question 6**

- a) Consider one of the University's student clubs or societies to which you are a member. List and define each of the entities in this enterprise. Then, draw an E-R diagram for this enterprise showing these entities and their relationships. [10]
- b) What are the constraints on these entities in the enterprise? [4]
- c) Reduce the E-R diagram in (a) into tables. [6]

**<<End of Question Paper>>**