

# UNIVERSITY OF SWAZILAND

## *FACULTY SCIENCE* *DEPARTMENT OF COMPUTER SCIENCE*

### SUPPLEMENTARY EXAMINATION 2007

Title of paper : Databases and their design II  
Course Number : CS 346  
Time allowed : Three (3) hours  
Instruction : Answer **FIVE** questions

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

1.
  - a) State the purpose and qualify (as unary or binary) any two relational algebra operations. [4]
  - b) How can the structure of a table be changed in SQL? What general types of changes are possible? [3]
  - c) Add a new attribute, **Dept\_Type**, to the table **DEPT** (department) and set its value to **MNGMNT** (management) for all existing departments. [3]
  - d) State and prove the formal definition of the division operation. [5]
  - e) Describe the purpose, advantage and disadvantage of indexes. [5]
  
2.
  - a) Using a bookshop enterprise (has relations on books, authors, editors, etc) and stating all assumptions (especially on attributes and their names) write algebraic relational queries to:
    - i) list all book titles and the names of their authors [3]
    - ii) list all author's and editor's cities for all authors and editors who have the same names [3]
    - iii) produce a list all author's names and dates of birth for all authors who live in Mbabane and all those who live in Manzini [3]
    - iv) produce a list of all author's names for all authors who have written at least three books and also live in Mbabane – write this query in two ways [3]
    - v) list all the columns in the publisher's table together with their data types. [3]
  - b) What can you say about the execution of a query that involves a view? [5]
  
3. For each of the questions in 2 a) above write the appropriate SQL and QBE formulation for each of the five queries. [20]
  
4.
  - a) Describe a third normal form and the types of problems associated with tables that are not in third normal form. [10]
  - b) Convert the following table to 3NF: [10]
 

**Student (std\_num, stud\_name, numb\_cred, adv\_num, adv\_name, crse\_num, crse\_descr, crse\_grade)**

where: **stud\_num** determines **stud\_name**, **numb\_cred**, **adv\_num** and **adv\_name**; **adv\_num** determines **adv\_name**; **crse\_num** determines **crse\_descr**; and the combination of a **stud\_num** and a **crse\_num** determines a **crse\_grade**

5.

- a) Using the types of entities found in a bookshop enterprise as in question 2 above create an example of a table that is in 1NF but not in 2NF, and, an example of a table that is in 2NF but not in 3NF – in each case justify your choice of example. *[10]*
- b) In a) above, convert your 1NF table to a 2NF table; and the 2NF table to 3NF. *[10]*

6. Using the entities found in a college environment (faculties, students departments, courses, etc), create an example of a table that is in 1NF but not in 2NF and an example that is in 2NF but not in 3NF. In each case justify your answer and convert to 3NF. *[20]*