UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION, 2014

Title of Paper	:	**Databases and their Design II**
Course Number	:	**CS 346**
Time Allowed	:	**Three (3) Hours**
Instruction	:	**Answer question 1 (in Section A), and, <u>ANY FOUR</u> questions in Section B**

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

SECTION A (COMPULSORY QUESTION)

Question 1

Design a database for a chain of bookstores for Sipho. The database should keep information about publishers, authors and obviously books. Consider the following six user views: i) for each publisher, list the publisher code, the name, and the city in which the publisher is located; ii) for each branch, list the number, the name, the location, and the number of employees; iii) for each book, list its code, title, the code and name of the publisher, the price, and whether or not it is a paper back; iv) for each book, list its code, title, type, price, number and name of each author of the book (multiple authors must be listed in the order they appear in the book, which or may not be in alphabetical order); v) for branch, list the number and name, also, the code and title of each book currently in the branch as well as the number units of the book currently in stock; vi) for each book, list the code and title, also list, the branch (number and name of branch) having the book in stock alongside the number of copies available. **[20]**

SECTION B (ANSWER ONLY FOUR QUESTIONS)

Question 2

(a) What are the advantages of using indexes? When should they not be used? **[3]**

(b) Discuss functional dependency and its importance in database design. **[3]**

(c) Differentiate between a primary and a referential key. **[4]**

(d) Define a data model. **[2]**

(e) What is the function of data modelling? **[4]**

(f) Why is database design important? **[4]**

Question 3

a) Discuss the problems associated with unnormalised relations. **[8]**

b) Using entities found in your High School, create tables, each with at least five entities: one unnormalized; one in 1NF; and one in 2NF stating why each table qualifies into its category. Normalise these tables to 3NF table(s). **[12]**

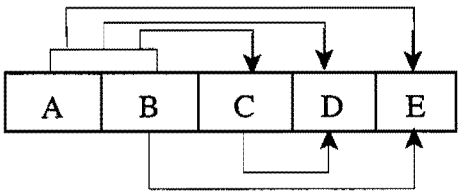
Question 4

a) Given below, is a set of functional dependancies of attributes A to G. Assuming a relation that contains only these attributes, discuss each dependency. **[8]**

A, B --> C, D, E, F, G
E --> G
D --> A
C --> F

b) Normalise this relation, in a) above, to 3NF. **[6]**

c) Normalise the following relation to 3NF **[6]**



Question 5

a) Discuss the two integrity rules, indicating the reason(s) for enforcing each rule. **[4]**
b) Describe the system catalog in DBMSs giving the three data items in each. **[4]**
c) Discuss four categories of relational systems and their characteristics. **[12]**

Question 6

Consider a design in your community library database. Initial analysis has determined the following data.

Each library book has a call number, a title, an author, a publisher, and edition. The library may have more than one copy of the same book. Each copy of a book has a copy number, a purchase date and the price. Users of the library are issued library cards. Each user has a card number, name and address. There are two types of library users: *adults* and *children*. Every child has exactly one adult sponsor who must also be a library user. For each student the school and grade must be recorded. Library users may borrow books and for every book on loan the due date is recorded.

a) Draw an ER diagram to illustrate the structure of the above database. **[10]**
b) Break down the above ER diagram into tables, indicating all special keys. **[10]**