

# UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

*DEPARTMENT OF COMPUTER SCIENCE*

**MAIN EXAMINATION, MAY 2016**

Title of Paper : Databases and their Design II  
Course Number : CS 346  
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) Define the primary and the referential keys. [4]
- (b) What are the advantages and disadvantages of using indexes? [2]
- (c) On relational mainframe DBMSs, who or what is responsible for the decision to use a particular index? How about on microcomputer DBMSs? [4]
- (d) Why is it a good idea for the DBMS to update the catalog automatically when a change is made in the database structure? Could users cause problems by updating the catalog themselves? [4]
- (e) Describe and explain the importance of the two integrity rules. [6]

### Question 2

Design (Information level) a database for a chain of bookstores. The database should keep information about publishers, authors and obviously books. Each book has a code that uniquely identifies the it. In addition, record the title, the publisher, the type of book, the price and whether the book is paperback. Also record the author or authors of the books along with the number of units of the books that are in stock in each of the branches of the chain.

This information is to be used in a variety of ways. For example, a customer may be interested in books written by a certain author or of a certain type. You need to be able to tell the customer which books by the author or of that type are currently in stock. If not in stock in that branch you have to be able to determine which branch currently has that book.. [20]

### Question 3

Using entities found in a furniture shop, create an example of a table that is not normalised, and a table in 1NF but not in 2NF, a table in 2NF but not in 3NF, and a table in 3NF. In each case justify your example – i.e. why you think your un-normalised table is not in 1NF, why your 1NF table is not in 2NF, etc. Normalise your 1NF and 2NF tables into 3NF tables [20]

### Question 4

Convert the following table to 3NF

STUDENT (stud\_num, stud\_name, numb\_cred, adv\_num, adv\_name, crse\_num, crse\_desc, grade)

where: stud-num determines stud\_name, numb\_cred, adv\_num, and adv\_name; adv\_num determines adv\_name; the combination of a stud\_num and a crse\_num determines a grade.

[20]

**Question 5**

Specify and design a database of your own. The database must consist of at least five entities, and each entity comprised of at least five attributes with three attributes being composite attributes. Make sure to specify all requirements and functional dependencies of your database in the design. [20]

**Question 6**

(a) What does functional dependency mean, and its importance? [5]

(b) Convert the following table to an equivalent collection of tables that is in 3NF. The name of the table is PATIENT:

PATIENT(HHNUMB, HHNAME, HHADDR, HHBAL, PATNUMB, PATNAME,  
SERVCODE, SERVDESC, SERVFEE, SERVDATE)

This is a table concerning information about patients. Each patient belongs to a household. The head of the household is designated as HH in the table. The following dependencies exist in PATIENT:

PATNUMB  $\rightarrow$  HHNUMB, HHNAME, HHADDR, HHBAL, PATNAME

HHNUMB  $\rightarrow$  HHNAME, HHADDR, HHBAL

SERVCODE  $\rightarrow$  SERVDESC, SERVFEE

PATNUMB, SERVCODE  $\rightarrow$  SERVDATE

[15]