

# UNIVERSITY OF ESWATINI

FACULTY OF SCIENCE AND ENGINEERING

*DEPARTMENT OF COMPUTER SCIENCE*

## *MAIN EXAMINATION, MAY 2019*

Title of Paper : **Databases and their Design I**  
Course Number : **CSC 272**  
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 a database management system. [4]
- (b) Compare and contrast a naive and a sophisticated user? [6]
- (c) Discuss the advantages of a DBMS over a traditional file system. [10]

### Question 2

- (a) Describe a data schema and its importance in databases? [4]
- (b) Discuss the importance of a data model and its importance. [6]
- (c) Describe a weak entity set with the aid of an example and an ER diagram. [4]
- (d) Why is data abstraction important for DBMSs. [6]

### Question 3

- (a) Distinguish between an attribute and metadata. [5]
- (b) The Standard Bank of Eswatini operates different types of accounts: savings, call and current accounts. All the accounts are identified by an account number and date of opening the account; but the savings account is also identified by an interest rate; the call account identified by savings period and special rate; the current account is also identified by charges and cheque fees. All customers, who open accounts, are identified by their names, date of births, address, and their personal national identity numbers.
  - (i) Draw an ER diagram for this database to emphasize the similarities between the different accounts the bank offers. [8]
  - (ii) Break down the ER diagram into its equivalent tables. [7]

### Question 4

- (a) Why is an ER diagram desirable? [5]
- (b) Draw a relational schema to represent the database of a bookshop. This bookshop organizes information about publishers, authors and books. Each book has a code that uniquely identifies the book. In addition, the title, publisher, type of book, price and whether book is paperback or not is recorded. The author or authors of each book is recorded alongside the number of units the book are in stock in each of the branches of the bookstores. If a book is not available in one branch the database should be used to determine if any of the other branches currently have it in stock. Each branch is identified by name, number, location and number of employees. Publishers are identified by a publisher code, name and city where the publisher is located. The authors involved in the books sold are identified by name and number. [15]

### Question 5

- a) Discuss the advantages and disadvantages of a network model over a relational model, emphasizing when you would prefer to use it over the relational model. [10]
- b) Distinguish between the hierarchical model and the network model, and how would you implement the hierarchal structure on a database that is not a tree. [3+7]

### Question 6

Given the following relations:

**Employee**(Fname, Minit, Lname, EmplPin, Bdate, Address, Sex, Salary, Super\_Pin, Dnum)

**Department**(Dname, Dnum, Mgr\_Pin, Mgr\_start\_date) **Dep\_Loc** (Dnum, Dloc)

**Project** (Pname, Pnum, Ploc, Dnum) **Works\_On** (Pin, Pnum, Hours)

**Dependent** (EmplPin, Dependent\_name, Sex, Bdate)

Specify the following **algebraic queries** for the database schema.

- a) Retrieve the names & addresses of all employees in department 5 who work less than twelve hours per week. [2]
- b) List the names of all employees who have a dependant who is less that 21yrs old. [2]
- c) Find the names of all employees who are directly supervised by Franklin Wong. [2]
- d) For each project, list the project name and total hours spent on that project. [2]
- e) Retrieve the average salary of all female employees. [2]

Specify the **SQL** equivalent queries for each one of the above.

[2 x 5]