UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

MAIN EXAMINATION, DECEMBER 2016

Title of Paper	:	**Databases and their Design I/ Databases I**
Course Number	:	**CS 345/ CS 272**
Time Allowed	:	**Three (3) Hours**
Instruction	:	**Answer all questions in SECTION A and any three (3) questions in SECTION B**

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

SECTION A

1. a) Define the following terms:
   i) Information [1]
   ii) Metadata [1]
   iii) DBMS [1]
   iv) Data abstraction [2]

   b) Define Entity type, Relationship set and a Domain. [6]

   c) Why is data independence important in Databases? [3]

   d) What is the difference between controlled and uncontrolled redundancy? Use a students' residence and their warden as an illustration. [4]

   e) Name and discuss two different types of database end users. [2]

2. a) Discuss any two advantages and two disadvantages of a relational database system over a hierarchical database system. [7]

   b) Draw an ER diagram to illustrate a portion of a university database where instructors are considered to offer or teach some course. Courses are offered during some semester. Hence there are three entities: instructor, course and semester but each one is associated with the next by at least two relationships. Allocate appropriate attributes and relationships to these entities and draw the ER diagram. [7]

   c) A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate (some are reserves) in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER diagram for this application, stating any assumptions made. Choose your favorite sport (netball, soccer, baseball, etc) [6]

SECTION B

3. a) What is meant by integrity as used in database systems? [2]
   b) Discuss three disadvantages of a DBMS over a traditional file system. [6]
   c) How does a DBMS increase productivity in an enterprise (an advantage) [4]
   d) Why can a failure in a database environment be more serious than one in a traditional file system? [4]
   e) Discuss the strength and weakness in terms of security of a DBMS [4]

4. a) What is the common name for tuple and how is it used? [3]
   b) Define a relation. [3]
   c) Contrast an un-normalized relation from one that is normalized. [3]
   d) Describe how a network that is not a hierarchy, can be implemented by means of a hierarchical model DBMS. [6]
   e) What are the advantages of the hierarchical model as compared to the other two models? What are the disadvantages? [5]

5.
   a) Draw an E-R diagram for the following clubs' database. Each student has a unique student id, a name, and an email; each club has a unique club id, a name, a contact telephone number, and has exactly one student as its president. Clubs organize activities and students can participate in any of them. Each activity is described by a unique activity id, a place, a date, a time and those clubs that organize it. If an activity is organized by more than one club, different clubs might contribute different activity fees. [10]
   b) Decompose the above E-R diagram onto its relations [10]

6. a) Discuss the importance of data modeling. [3]
   b) Explain how the ER model helps produce a more structured relations design environment. [4]
   c) What is structural independence, and why is it important? [3]
   d) Discuss the lack of data independence in traditional file systems. [3]
   e) The MTS company wants to track each part used in each piece of equipment; each part is bought from a specific supplier. Draw a network structure and identify the sets for the MTS database. (Note: A piece of equipment is composed of many parts but each part is used in only one specific equipment. A supplier can supply many parts but each part is supplied by one supplier) [7]