

UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

FINAL EXAMINATION, NOVEMBER 2013

Title of Paper : Databases and their Design I
Course Number : CS 345
Time Allowed : Three (3) Hours
Instruction : Answer any **FIVE** questions

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

Question 1

- (a) Describe and explain the importance of a primary key in DBMS. [4]
- (b) Define a DBMS. [2]
- (c) what are the potential initial costs of implementing a DBMS? [4]
- (d) Explain why database design is important. [2]
- (e) Discuss the terms: data, field, metadata and tuple. [4]
- (f) Discuss structural independence and its importance [4]

Question 2

- (a) How is productivity improved in a DBMS vs in a traditional file system? [4]
- (b) Discuss any two disadvantages of a DBMS. [4]
- (c) Draw a detailed E-R diagram of your High School as you envisage its database (as per a request of your old principal who has heard that you are doing CS 345 and wants you to help computerise the data in the school). [8]
- (d) Describe two advantages and two disadvantages of a hierarchical database system. [4]

Question 3

Considering a file structure of the form: JOB(Proj_Num, Proj_Name, Empl_num, Job_Code, Job_Chg_Hour, Proj_Hours, Empl_Phone); where each project is done by more than one employee and each employee works on more than one project; each employee has only one expertise.

- (a) Write an SQL query to create the table described above. [4]
- (b) Qualify each data type you used in (a). [4]
- (c) Fit in three rows of data to the given file structure. [2]
- (d) Identify and discuss the serious data redundancy problems exhibited by a file structure of this form. [6]
- (e) What problems might you encounter if one of the projects were deleted. [4]

Question 4

- (a) What is a relationship set within a relational database? [2]
- (b) Define a data model and state what designers use it for. [3]
- (c) Discuss the advantages and two disadvantages of relational databases. [5]
- (d) Describe how a network model, that is not purely hierarchical, can be implemented in a hierarchical system. [5]
- (e) What are the advantages and disadvantages of the network model in comparison with the other two record-based logical models? [5]

Question 5.

- a) Use the knowledge of your University (subjects, teachers, students, departments, etc) to describe the concept of generalisation in database systems. Illustrate this concept using an ER diagram of at least 7 entities. [10]
- b) Reduce the E-R diagram in (a) into tables (two ways). [10]

Question 6.

Use a school or university setting to illustrate and emphasize your answers where necessary.

- (a) What are the main operations of relational algebra? [3]
- (b) What is the Cartesian product? Illustrate your answer with an example. [5]
- (c) What is the difference between PROJECTION and SELECTION? [4]
- (d) Explain the difference between natural join and the outer join. [4]
- (e) Using an example show that the Set Intersection can be done using one of the main operations. [4]