UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

FINAL EXAMINATION, *DECEMBER 2010*

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

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Question 1

(a)   Differentiate between a database and a database management system.   [4]

(b)   Briefly describe, with the aid of an example, redundancy and the problems associated with it.   [6]

(c)   Why is it necessary to specify integrity constraints when designing a database?   [4]

(d)   Briefly describe the three main data models.   [6]

Question 2

(a)   Differentiate between information and data   [4]

(b)   Discuss data independence and its importance   [4]

(c)   Briefly describe abstraction and its advantage as enjoyed by databases.   [2]

(d)   Banks keep accounts for their customers. For each customer they record the customer name, graded tax number, address; each account is associated with an account number and a balance; and each account can either be a savings account or a current account, current accounts have an overdraft limit whilst savings have an interest rate. Draw an ER diagram to relate a customer to an account with an appropriate relationship set of your choice.[10]

Question 3

a)   What is meant by integrity as used in database systems?   [2]

b)   Why should DBMS be large? How can the size of a DBMS be a disadvantage?   [3]

c)   How does consistency result from controlling or eliminating redundancy?   [3]

d)   How does a DBMS increase productivity in an enterprise (an advantage)?   [4]

e)   Why can a failure in a database environment be more serious than one in a traditional file system?   [4]

f)   Discuss the strength and weakness in terms of security of a DBMS   [4]

Question 4

(a)   What is a relationship within a relational database?   [3]
(b)   Discuss the advantages of the relational database and two disadvantages.   [5]
(c)   Define a data model and state what designers use it for.   [3]
(d)   Describe how, a network model that is not purely hierarchical, can be implemented as a hierarchical model.   [5]
(e)   What are the advantages of the hierarchical model as compared to the other two record-based logical models? What are the disadvantages?   [4]

Question 5
Consider the following database schema:

EMPLOYEE (F-name, L-name, Pin, B-Date, Sex, Salary, Super-Pin, D-no);
DEPT (D-name, D-no, Mgr-Pin, Mgr-Start-Date);
DEPT-LOCATION (D-no, D-Location); **WORKS-ON**(E-Pin, P-no, Hours);
PROJECT (P-Name, P-no, P-Location, D-no);
DEPENDENT (E-Pin, First-Name, Sex, B-date, Relation).

Specify relational algebra queries to:
a)   Retrieve the names of employees in department 5 who work more than 10 hrs on "**Product-X**" project   [3]
b)   List the names of employees who have a dependent with the same first name as themselves   [3]
c)   For each project, list the project name and the total number of hours (by all employees) spent on that project   [3]
d)   Retrieve the names of employees who do not work on any project [4]
e)   Retrieve the average salary of all female employees   [3]
f)   For each department, retrieve the department name and the average salary of employees working in that department   [4]

Question 6.

a)   Use the knowledge of your High School (subjects, teachers, departments, etc) to describe the concept of aggregation 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.   [10]

<< End of Question Paper >>