KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Department of Information and Computer Science

ICS 424-01: Advanced Database Systems
063 (FINAL EXAM)

Time Allowed: _100 Minutes_

Student ID: _____

Name: _____

Instructor: Muhammad Waheed Aslam

Problem	Points	Score
Q1: General Concepts	**60**	
Q2: Database Design process	**100**	
Q3: Data Warehousing	**40**	
Total	**200**	

Notes:

➢ Please skim through all the questions, make sure that you understand them, and then attempt to answer them with a time-allocation in mind. If any question is not clear, get it clarified during the _**first fifteen minutes**_.

➢ If you need to make any assumptions, please document them as part of your answers.

➢ There are **three** questions in this exam each focusing on a distinct aspect. You are expected to answer _**all**_ of them.

**August 22, 2007**

1. [General Concepts– (60 points)]

a) Mark each of the following definitions as true (**T**) or false (**F**)   (**20 points**)

1	Each cell of relation may contain several values from the same domain.	T	F
2	Each attribute has a distinct name.	T	F
3	Values of an attribute are all from the same domain.	T	F
4	Order of attributes has some significance.	T	F
5	Physical data independence refers to immunity of the conceptual schema to changes in the internal schema.	T	F
6	Order of tuples has no significance, theoretically.	T	F
7	Four basic (ACID) properties of a transaction are: Automatic, Controllable, Integrity and Durability	T	F
8	Functional Dependency describes the relationship between attributes in different relations	T	F
9	First Normal Form (1NF) is a relation in which the intersection of each row and column contains one and only one value	T	F
10	With NOT NULL, system rejects any attempt to insert a null in the column.	T	F

b) Number the definition on the right side the appropriate number from the left   (**20 points**)

1- A relation	is a named column of a relation.
2- Attribute	is a set of allowable values for one or more attributes.
3- Domain	is a number of tuples in a relation.
4- Degree	is a number of attributes in a relation.
5- Cardinality	is a table with columns and rows.
6- View	Dynamic result of one or more relational operations operating on the base relations to produce another relation.
7- Foreign Key	An attribute or set of attributes within one relation that matches candidate key of some (possibly same) relation.
8- Entity Integrity	A named relation, corresponding to an entity in conceptual schema, whose tuples are physically stored in database.
9- Referential Integrity	In a base relation, no attribute of a primary key can be null.
10- Base Relation	If foreign key exists in a relation, either the foreign key value must match a candidate key value of some tuple in its home relation or foreign key value must be wholly null.

c) Circle the correct answer (**20 points**)

    i. Among the limitations of file-based approach
        a) Separation and isolation of data.
        b) Data dependence.
        c) Incompatible file formats.
        d) All of the above.
        e) None of the above.

    ii. Among the advantages of DBMS are:
        a) data consistency, integrity, and sharing.
        b) data accessibility and responsiveness
        c) Increased productivity and concurrency
        d) All of the above.
        e) None of the above.

    iii. Database is
        a) A data definition language.
        b) A software system that enables users to define, creates, and maintains their data.
        c) a shared collection of logically related data
        d) All of the above.
        e) None of the above.

    iv. Components of DBMS environment are
        a) Data administrator, administrator, designers, application programmers and end users.
        b) Relational, object-oriented, hierarchical, and network.
        c) Hardware, software, data, procedures, and people.
        d) All of the above.
        e) None of the above.

    v. Data models are

        a) Object-based, record-based, and physical data models.

        b) Entity-relationship, object-oriented and relational data model.

        c) Semantic, network, and hierarchical data models.

        d) All of the above.

        e) None of the above.

vi. Among the objectives of three level architecture is

a) All the users should not be able to access same data.

b) User should need to know physical detail

c) DBA should be able to change database storage structure with out affecting the user views.

d) Transmits response to client, checks authorization and provides recovery.

e) All of the above.

f) None of the above.

vii. Among functions of a DBMS

a) Transaction, recovery and integrity services.

b) Conceptual, logical and physical modeling

c) External, conceptual and internal views

d) DDL compiler and DML preprocessing

viii. The entity integrity

a) A null value for attribute that is unknown

b) No attribute of a primary key can be null

c) A foreign key must not equal null

d) Rules specified by database administrators

ix. Authentication

a) Is granting of a right or privilege, which enables a user to have legitimate access

b) Includes the right to access, to create, to delete database objects

c) Includes the right to run DBMS programs

d) Determines whether a user is, who he or she claims to be

x. Query Optimization

a) The activities involved in retrieving data from the database

b) The activity of choosing an efficient execution strategy for processing a query

c) Converting SQL statement into a relational algebra statement

d) Managing simultaneous queries without having them interfere with one another

2. [Database Design Process– (100 points)]

a) Briefly describe database design process and list its various steps?   **(20 Points)**

b) You are required to develop a database for a company with the following requirements:
   - The company is organized into departments. Each department has a unique name, a unique number and a particular employee who manages the department. The company keeps track of the starting date when that employee began managing that department. A department may have several locations.
   - A department controls a number of projects, each of which has a unique name, a unique number and a single location.
   - The company stores each employee's name, Social security number, address, salary, sex and birth date. An employee is assigned to one department but may work on several projects, which are necessarily controlled by the same department. The company keeps track of the number of hours per week that the employee works on each project. It also keeps track of the direct supervisor of each employee.
   - The company keeps track of the dependents of each employs for insurance purposes. We keep each dependent's name, sex, birth date and relationship to the employee

(i)   Develop an Enhanced Relationship (EER) Model to represent the above requirements using the following steps: **(20 points)**

   - Identify Entity types, and for each entity identifies its attributes and its primary key.
   - Identify relationship types, attributes (if any), and determine the cardinality and participation constrains of each relationship.
   - Specialize/generalize entity types (where appropriate)
   - Categorize entity types (where appropriate)

(ii)   Draw an EER Diagram representing the EER model presented in part (i)   **(20 points)**
(iii)   Map you EER diagram to relational model using algorithm discussed in class.   **(20 points)**
(iv)   Design physical model by taking all possible constraints into consideration.   **(20 points)**

Q1 Continued ….
Note : Your final project grade will also be determined on the basis of your performance in Q # 1

a) Q1 Continued ….

3. [Data Warehousing – (40 points)]

a) What is a data warehouse? **(10 Points)**
b) List steps to build a data warehouse? **(10 Points)**
c) Differentiate how online transaction processing (OLTP) differs from OLAP/data warehousing. **(20 Points)**