King Fahd University of Petroleum and Minerals

Department of Information and Computer Science

ICS 324: Database Systems

Spring 2007-2008

Date: 16-March-2008 **Major Exam I: Basics of Database Systems & Data Models** **Time Slot:** 6:10 p.m. – 7:25 p.m.

Duration: 75 minutes **Total Points:** 100

Name:	**Student ID #:**

Notes:

- Check that you have **seven** (7) pages, including this one, containing **four** (4) questions.
- 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 state them clearly as part of your answers.
- There are **four** questions in this exam each focusing on one of the topics. You are expected to answer **all** of them.
- In some questions some parts may have some choices. Clearly identify which selection you decided to do.

Scores:

Problem	Points	Score
Question 1: Databases Concepts	**45**	
Question 2: Relational Database Model	**30**	
Question 3: ER & EER Model: Concepts	**35**	
Question 4: ER & EER Model: Design	**40**	
Total➔	**150**	

1. [Databases Concepts] **(45 Points)**

A. (Answer **four** parts only**)** **(20 points)**

i. What is the difference between Database Management System (DBMS) and Database system?

ii. List two of the advantages of using the DBMS approach and briefly explain one of them.

iii. What is the difference between the database administrator and the database designer?

iv. List two situations where it is not recommended to use a DBMS.

v. Briefly discuss one of the levels of the three-Schema Architecture, and identify which data model it uses.

vi. Briefly describe the difference between the conceptual and logical design phases of the database design process.

B. **(25 points)**

i. List two of the main criteria a DBMS can be categorized with its categories. (10 Points)

Criterion:_____ Categories:_____

Criterion:_____ Categories:_____

ii. Briefly describe only two of the following DBMS component modules: The DDL Compiler, the Pre-Compiler or the Query Compiler. (10 Points)

iii. List two of the database system utilities and briefly explain one of them. (5 Points)

2. [Relational Database Model] (30 points)]

A. Describe two of the following concepts in the context of the relational model: (1) relation, attribute*;* (2) intension and extension; (3) degree and cardinality. **(8 points)**

B. What is the difference between the primary key and a foreign key in a relation? **(8 points)**

C. What is the difference between entity integrity and the referential integrity constraints? **(8 points)**

D. Consider the following relations for a database that keeps track of auto sales in a car dealership.**(6 points)**

CAR (Serial#, Model, Manufacturer, Price)

OPTIONS (Serial#, OptionName, Price)

SALES (SalespersonId, Serial#, Date, SalePrice)

SALESPERSON (SalespersonId, Name, Phone)

Specify the foreign keys for the above schema, showing which relation they refer to.

3. [ER & EER Model: Concepts] (35 points)]

A. (**20 points**)

i. Briefly describe the three basic components of the Entity-Relationship Model. For each component outline two of its types.)

ii. Briefly describe two of the following concepts in the EER model and present an example that clearly presents the concept: Generalization, Specialization or Categorization.

B. Given the EER diagram in the next page, answer only three of the following: (**15 points**)

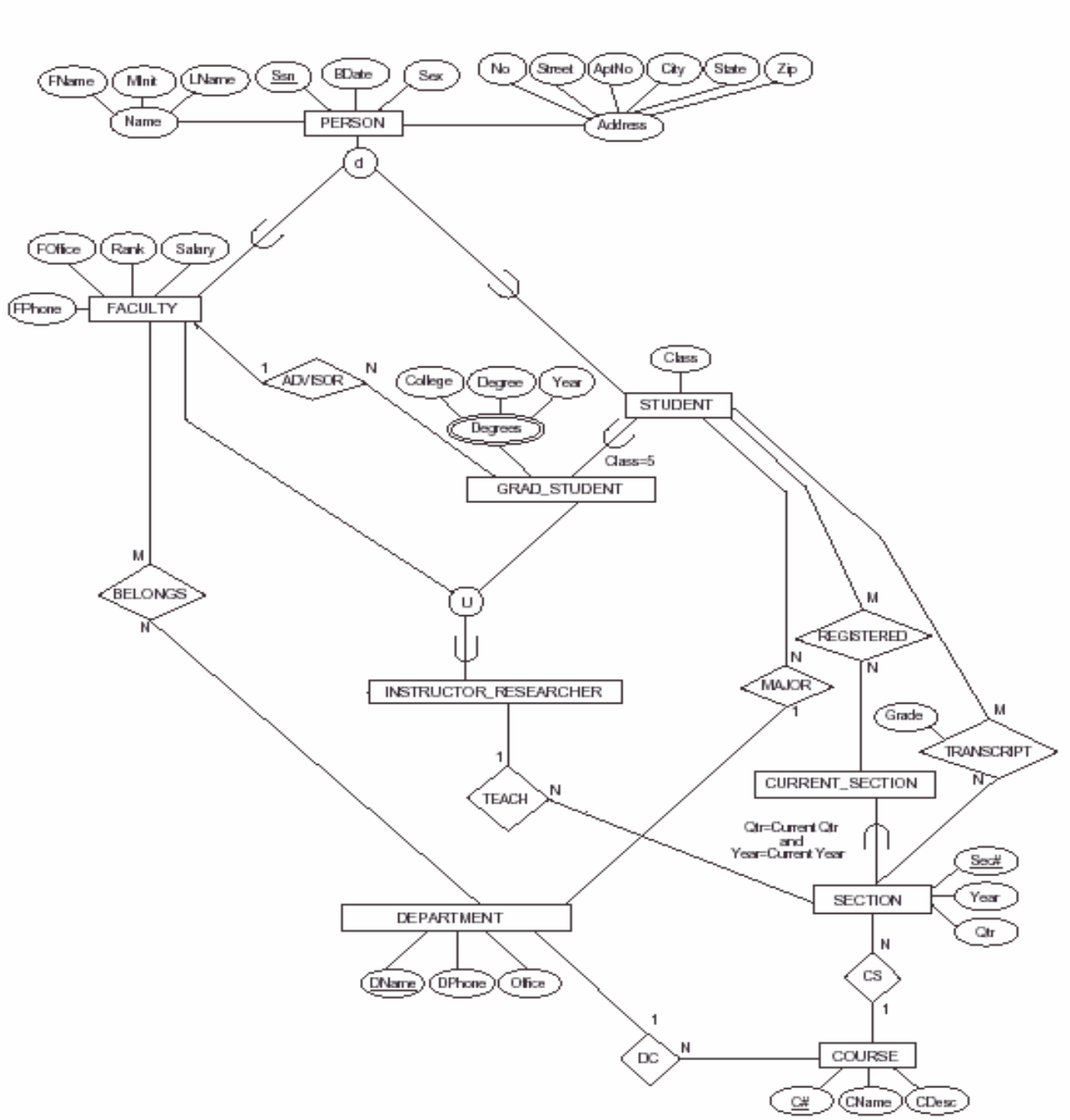
i. Identify one relation with attributes, its participating entities and their participations.

ii. Identify one specialization, its superclass, subclass and its completeness constraints.

iii. Identify one categorization, and its superclasses and subclass.

iv. Identify one multi-value attribute and another composite attribute.

v. Identify an entity that participates in more than one relation, with the entities participating with it in the relations and all cardinality constraints.



An EER Diagram for a database for part (b) of Question 3

4. [ER & EER Model: Design] (40 points)]

Design an EER diagram for the following Dental Clinic database. Your diagram should have all the needed details. You may make any reasonable assumptions but you have to state them clearly

a. The clinic has several dentists. Each dentist has a unique Number, name, nationality, multiple room-number, salary, birth-date and home-address (Box, City, Zip).

b. Each client (patient) has a unique Code, name, home-phone, work-phone, address, and birth-date. Each client is assigned to one dentist. All future visits will be to the same dentist. A client can be insured or self-paying. An insured client should have an insurance company-name, and company-Phone, while a self-paying client must have a bank-name and a bank account.

c. Each visit of a client is described by a date, type, action, fee, and date-of-next-appointment

A. Develop an Enhance Entity 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)

B. Draw an EER Diagram representing the EER model presented in part (i) (**20 points**)