Mansoura University		Department: Computers Engineering And Systems **Total Marks: 90 Marks**	Faculty of Engineering

Course Title: Database 1	Course Code: CSE 3313	Year: 3rd
Date: Jan, 9; 2013 (First term)	Allowed time: 3 hrs	No. of Pages: (3)

Remarks: (Answer the following questions… assume any missing data)

Question No. (1) (32 Marks)

(Q1-A) [3 points] State the Advantages and disadvantages of Database engines?

(Q1-B) [3 points] List the different ways of implementation of the Client/Server Architecture?

(Q1-C) [5 points] For each of the following statements, indicate whether it is TRUE or FALSE You will get 0.5 point for each correct answer, -1 point for each incorrect answer.

(1) In E/R model, only entities can have attributes.
(2) Entity sets are weak when their key attributes come from other classes to which they are related.
(3) All relations in 3NF also in 2NF.
(4) In relational algebra, the project operator may change the number of tuples.
(5) The logic of conditions in SQL is 2-valued logic: TRUE, FALSE.
(6) < tuple > IN < relation > is true if and only if < relation > is not empty.
(7) A view is updatable if it is defined by selecting some attributes from a single relation.
(8) In SQL, an INSERT statement always requires all column values to be specified.
(9) Easy implementation is the major advantage of 3-tier architecture over 2-tier architecture.

(Q1-D) [7 points] Given two relations $R1$ and $R2$, their cardinalities are N1 , N2 respectively, Also, their degrees are M1, and M2 and N2 > N1 > 0, M2 < M1 < 10 give the minimum and maximum possible sizes (in tuples) for the resulting relation produced by each of the following relational algebra expressions. In each case, state any assumptions about the schemas for $R1$ and $R2$ needed to make the expression meaningful:

(1) $R1 \cup R2$, (2) $R1 \cap R2$, (3) $R1 - R2$, (4) $R1 \times R2$, (5) $\sigma_{a=5}(R1)$, (6) $\pi_a(R1)$, and (7) $R1/R2$

Q1-E) [4 points] **State** the basic file organization that is best for a large file to : 1)Search for records based on a range of field values. 2) Perform inserts and scans where the order of records does not matter.3) Search for a record based on a particular field value.

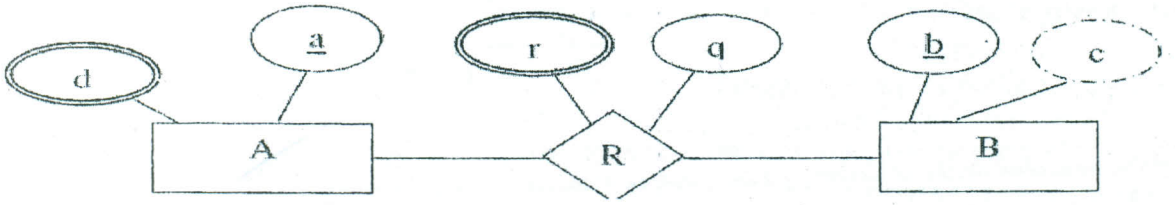
(Q1-F) [10 points] Consider the following schema for an airline database (primary key attributes are in **bold**): FLIGHTS (**flight_num**, source_city, destination_city) : DEPARTURES (**flight_num, date,** plane_type) : PASSENGERS (**passenger_id,** passenger_name, passenger_address) BOOKINGS(**passenger_id, flight_num, date,** seat_number)

Express the following queries in relational algebra

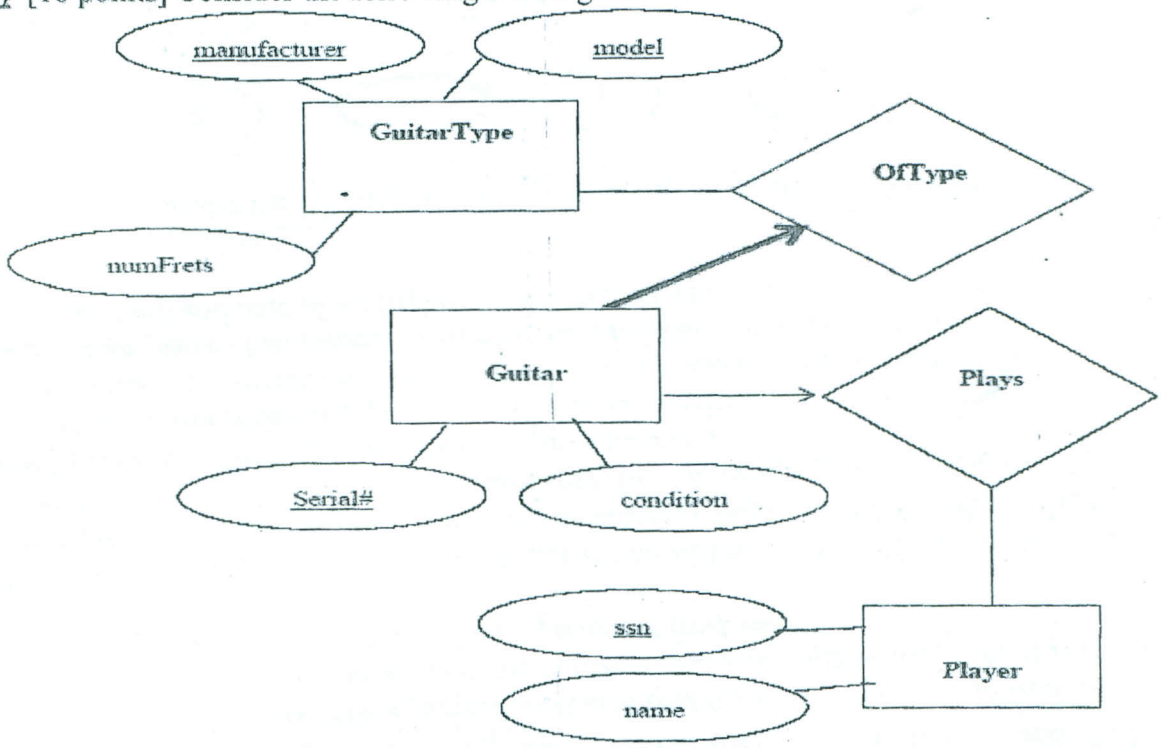
a) Find the cities that have direct (non-stop) flights to both Honolulu and Newark.
b) Find the passenger_name of all passengers who have a seat booked on at least one plane of **every** type.
c) Find the flight_num and date of all flights for which there are no reservations

Question No. (2) (32 Marks)

(Q2-A) [6 points] Consider the ER diagram below, Mapping it into its corresponding Relations Contents



(Q2-B) [18 points] Consider the following ER diagram



a) Create a relational schema (with SQL CREATE TABLE statements) for this diagram. Be sure to label all primary and foreign key constraints. The types of the attributes are as follows: INTEGER: GuitarType.numFrets, Guitar.serial#, Player.ssn; CHAR(20): all others

b) Say that we want to impose an additional constraint that a guitar can be played by at most one player. Indicate this new constraint **on the original diagram** for this question **(Be sure that the change is clearly indicated).**

c) For the change in part b, indicate (below) how your CREATE TABLE statements would have to be changed to reflect this.

d) Now, say that we want to add the fact that some players are teachers that teach other players. Teachers can teach multiple players and players can have multiple teachers. Indicate this new information on the original diagram for this question (Be sure that the change is clearly indicated, there will be no regarding on this part).

e) Write the CREATE TABLE statement(s) that capture this information. Note, this may cause you to change one or more of your original CREATE TABLE statements.

(Q2-C) [8 points] Draw a (simple) E-R diagram that results in a primary key/foreign key constraint to be created between tables. Show the SQL statements that create the tables including the foreign key and primary key indications.

1) For the relational tables you generated in question 2(C), Describe which **insert** and **delete** operations in this database must be checked to ensure that referential integrity is not violated for that foreign key. Please state specifically which operations on which relations can cause problems.

2) Consider a database of employees in which we need to record information about employees' addresses. Name one condition which would cause you to make "address" an **entity set** of its own rather than an **attribute** of the employee entity set.

Question No. (3) (40 Marks)

(Q3-A) [12 points] What is meant by third normal form (3NF)? Examine the following table to check if it is in 3NF. If yes, explain your answer. Otherwise convert the table into 3NF

ClintNo	CName	ProportyNo	Paddress	Rent Start	Rentfinish	rent	ownerNo	Oname
CR76	John kay	PG4	6 lawrence St,Glasgow	1-Jul-00	31-Aug-01	350	CO40	Tina Murphy
		PG16	5 Novar Dr, Glasgow	1-Sep-02	1-Sep-02	450	CO93	Tony Shaw
CR56	Aline Stewart	PG4	6 lawrence St,Glasgow	1-Sep-99	10-Jun-00	350	CO40	Tina Murphy
		PG36	2 Manor Rd, Glasgow	10-Oct-00	1-Dec-01	370	CO93	Tony Shaw
		PG16	5 Novar Dr, Glasgow	1-Nov-02	1-Aug-03	450	CO93	Tony Shaw

(Q3-B) [18 points] Consider the following relations:

Students(snum:integer, sname:string, major:string, level:string, age:integer)
Faculty(fid:integer, fname:string, deptid:integer)
Class(cname:string, meets at:string, room:string, fid:integer)
Enrolled(snum:integer, cname:string)

a) Write a SQL statement to create relation Students, Faculty, Class and Enrolled respectively; Declare a primary key and foreign keys (if any) on each relation. Note that snum and cname in Enrolled should be consistent with snum in Students and cname in Class respectively;

b) Write a SQL statement to insert into the database the fact that the 22 year-old senior CS student 'Rahaman ', with snum 111, is enrolled in class CSE411. (hint: Both Students and Enrolled tables need to be updated.)

c) Write a SQL statement to delete all the classes taught by the faculty with fid 111.

d) Write a SQL statement to update the age of each student by one year. Note that only the rows where sname has value(i.e., not Null) should be updated.

e) Write a SQL statement to find the name(s) of the professor(s) that teach the course(s) with the highest enrollment, i.e., the course(s) with the most students enrolled.

f) Suppose you want to enforce the constraint that no student is younger than 14. Can you use CHECK to implement this constraint? If Yes, how? If No, why?

g) Suppose you want to enforce the following constraint. When inserting a tuple into the Class table, fid of the inserted tuple must exist in the fid column of table Faculty. If fid is not found, then it must be automatically inserted into the table Faculty. Can you use CHECK to implement this constraint? If Yes, how? If No, why?

(Q3-C) [10 points] Consider the following schema (primary keys are underlined):
Student (sname, **sid**, gpa, level, deptno) - Course (**cno**, cname, deptno, units)
Dept (dname, **deptno**) - Takes (**sid**, cno)

a) Write a SQL query that returns the names (i.e., snames) of students who have taken more courses outside their department than inside their department. For this question, you can assume that all students in the database have taken at least one course inside their department.
b) Write SQL Query that returns the department numbers of those departments for which there are no courses being offered?
c) Write SQL Query that returns the id of the student with the highest GPA?