Metropolitan State University
ICS 311-50 Midterm Exam 2
Summer 2023

Date: 7/13/2023
Duration: 150 minutes
Points: 75

Name:
_____

A) True/ False (10 Points)

a. The use of triggers and stored procedures is advisable when writing database applications that need to be easily run on different relational DBMS choices (e.g.MySQL, Oracle, DB2) T----------F
b. In ER diagrams, a relationship set can exist between an entity set and itself. T----------F
c. We use ER diagrams to logically model our data. T----------F
d. It is possible for a table in a relational schema to have more than one key. T----------F
e. We can check a database instance to verify that an integrity constraint holds. T----------F
f. A relationship in an ER diagram must be uniquely determined by the entities in
that relationship. T----------F
g. A weak entity set in an ER diagram represents a collection of entities for which we
have not discovered a key yet. Later in the design phase when we learn more about
the domain, this set will be converted into a strong entity set by adding the
appropriate attributes. T----------F
h. A relation may have a number of candidate keys, but has only one primary key. T----------F
i. If every attribute of a table functionally depends on the primary key, the table is in
3NF. T----------F
j. The inability to insert a record into a relational table because of the absence of values for other attributes is called insertion anomaly. T----------F

B) (15 Points)

Write SQL statements to answer questions a, b , c and d based on the following schema. Primary keys are(BOLD and italicized) and attributes with the same names in different tables are foreign keys.

Doctors(***doctorId***, doctorName, specialty)
Patients(***patientId***, patientName, sex, patientBalance, numberOfVisits)
Records(***doctorId, patientId***, date, diagnosis, visitCost)

a) Create a view, called DoctorSmithsPatients, to list all the patients Dr. Smith has (be careful on this one). (5 Points)

b) Write a trigger, each time a row is inserted in the table Records, the numberOfVisits in the corresponding Patient row is updated by 1 (i.e. add 1 to the numberOfVisits). (5 Points)

c) Find the cost of the most expensive visit. (2 Points)

d) For each doctor, list doctor identifier, doctor name and the total number of visits that were administered by the doctor. (3 Points)

C) (10 points)

Consider the table below:

branchNo	*branchAddress*	*telNo*	*mgrStaff*	*name*
B001	8 Jefferson Way, Portland, OR 97201	503-555-361	S1500	Tom Daniels
B002	City Center Plaza, Seattle, WA 98122	206-555-675 6	S0010	Mary Martinez
B003	14 – 8th Avenue, New York, NY 10012	212-371-300 0	S0145	Art Peters
B004	16 – 14th Avenue, Seattle, WA 98128	206-555-313 1	S2250	Sally Stern

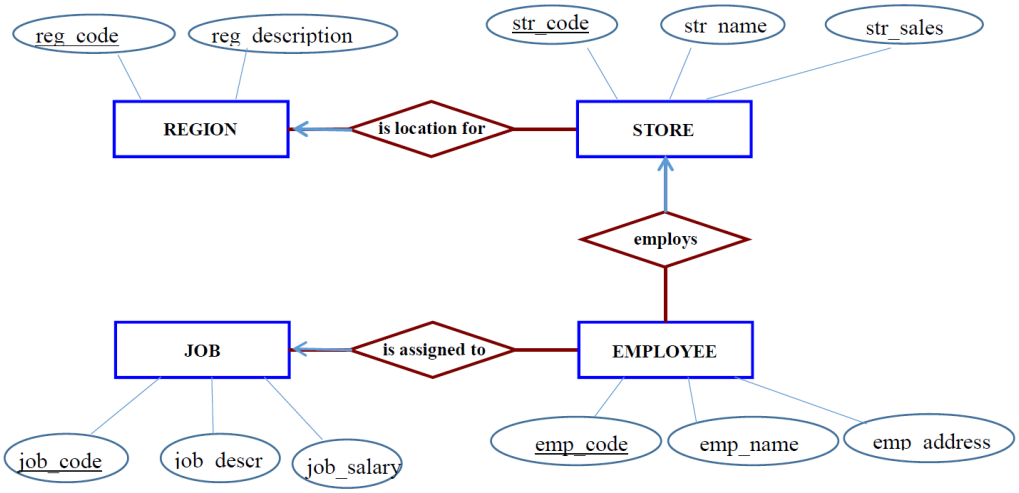
Primary key: branchNo

a) Why the above table is not in 3NF? (3 points)

b) Describe and illustrate the process of normalizing the data shown in this table to third normal form (3NF). (7 points)

D)(10 points)

Given the following ERD for a ProdCo. company:



Identify all relationships and their cardinality and write the corresponding business rules.

E) (5 points)

The university theater has a reservation system that allows users to

- look up information about a show (number of seats available, title, duration, cast, etc.),
- make reservation, and
- cancel a reservation.

All inquires, reservations, and cancellations are made through the theater's website. Discuss the following:

a) List two appropriate transactions in this system? (5 Points)

F) (10 Points)

Consider the following relational schema that consists of five tables. Primary keys are (BOLD and Italicized). Attributes with the same names in different tables are foreign keys.

Person (***driver_id***, name, address)
Car (***license***, model_id, color, driver_id)
Accident (***report_num***, date, location)
Participated (***report_num, license***)
Model(*model_id*, description, year)
PersonInsuranceCompany(***driver_id, insurance_company_id***, policy_issue_date)
InsuranceCompany(***insurance_company_id***, name, address)

Draw the corresponding ERD.

G)(15 Points)

You have just been hired as a consultant for a big airplane manufacturer. Impressed by your background in databases, they want you to completely redesign their database system. Talking with the people in the company, you get the following information:

- The database contains information about employees, factories and parts.

- Each employee has a social security number (SSN), name and salary. An employee is uniquely identified by his or her SSN.

- Each factory has an id, name and a budget. The id uniquely identifies a factory.

- Each part has an id and a name. The id uniquely identifies a part.

- Each employee works in only one factory, a factory can employ many employees.

- Each part is manufactured in at least one factory. A factory can produce many different parts.

a) Draw the Entity-Relationship diagram for the above application. (7 points)

b) Show the relational schema that corresponds to the above ER diagram. Make sure to clearly indicate primary keys and foreign keys. These would be the DDL needed to create the tables to support your ERD from a) (8 points)