



COMSATS UNIVERSITY ISLAMABAD (CUI)
DEPARTMENT OF COMPUTER SCIENCE
TERMINAL EXAMINATION FALL - 2022
BS (SE, CS, DS, AI)– IV & V SEMESTER

Course: CSC270 -Database Systems

Instructor: Dr. Malik A. Kamran

Maximum Marks: 25

Dated: 8th May , 2023

Time Allowed: 90 Minutes

1- [CLO-2] Apply the concept of domain and tuple relational calculus. [5Marks]

In this question, you are to write relational algebra queries, against the following needs, over a small sample database. The database contains following three relations:
You are given the following relations in a law firms database:

Client (Cid, Lid, Cname, birthYear, caseField)

Lawyer (Lid, Fname, Lname, Speciality, Salary, startingYear)

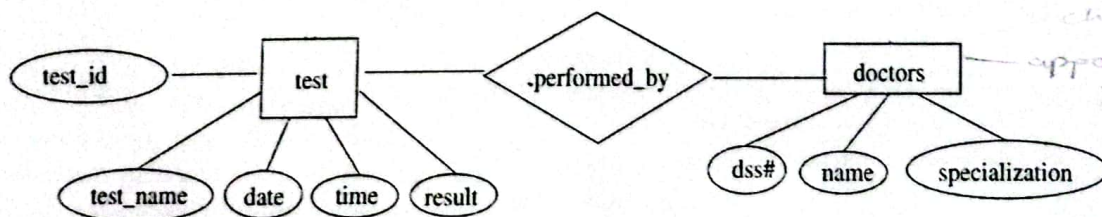
Firm (Fname, City, managerName)

Answer the following questions using relational algebra queries.

1. Find names of clients that were born after 1980 and their case field was "Traffic". [0.75]
2. Rename the resultant relation and their attributes in part 1. [0.25]
3. Find case fields of clients that were presented at least once by a law firm that is managed by "Aslam" or "Jamal". [1]
4. Find names of clients who were presented only by lawyers whose salary is at least 8000. [1]
5. Identify the pk and fk in each relation. Apply constraints on each attribute belonging to client relation. [2]

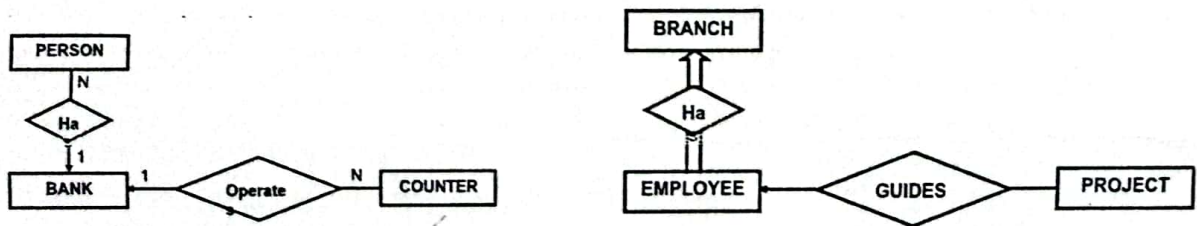
2- [CLO-3] Apply data modeling and normalization techniques to design database for small to medium size enterprise. [15 Marks]

Given the following Entity Relationship Diagram (ERD), modify it to include the following additional requirements.



- 2.1) Add another entity named patients which have been assigned some Id, has insurance, name and record has been maintained for the date they have been admitted and they have checked out from the hospital. Identify the relationship of patients with existing entities and complete the ER diagram. [1]

- 2.2) Patient name and doctor name should contain first name, and last name. [1]
- 2.2.1) Write the database schema for the generated ERD in 2.2. [1]
- 2.3) If we want to store the days of stay(DOS) for patient which can be calculated using admission date and check out date. [1] 9
- 2.4) If we want to add more details with insurance number like contact number for patients, how it would be reflected in ERD. [1] 10
- 2.5) We are going to add information about the doctor's availability(appointment) i.e., we wish to store the appointment days and checkup fee. [1] 11
- 2.5.1) Write the database schema for the generated ERD in 2.5. [1] 12
- 2.6) The doctors have different specializations including Pediatrician, cardiologists. For every doctor, we need to store their dss# and appointment hours. For Pediatrician, we need to store hospital name and reviews, For cardiologists, we need to store clinic name, address and contact no. Change the ERD obtained in Part V to Enhanced ERD modeling of this requirement. [2] 14
- 2.6.1) Write the database schema for the generated ERD in 2.6. [2] 16
- 2.7) Given the following Entity Relationship Diagram (ERD), Identify if there exists any connection traps or not. If yes identify the type of connection trap and reconstruct the given ERD. [4] 20



3- [CLO-1]: Explain database concepts and principles.

[5 Marks]

3.1) Provide at-least 2 examples of real time DBMS applications. Choose any one of the given example and apply the concepts of data abstraction to design the selected system. You have been asked to bring a work plan that identifies the phases of data design and includes the following information:

- 3.1.1) Description (levels) of the data design phase
- 3.1.2) the inputs of the phase
- 3.1.3) the outputs of the phase