



COMSATS UNIVERSITY, ISLAMABAD
Department of Computer Science
Theory Midterm Examination, FALL-2023

Course / Class: Database Systems - I (CSC270) / BDS-IV
Instructors: Dr. Nusrat Shaheen

Date: 10 Nov 2023
Time Allowed / Total Marks: 80mins. / 25

-----Mapped to CLO1- [Explain database concepts and principles] -----

Q1) Answer the following questions:

- 1.1. Provide at least 2 examples of real time DBMS applications and explain how ANSI spark Three schema Architecture provides data abstraction through its three layers to your system with the help of diagram.. [3]
- 1.2. Consider the following table declaration:
Staff (id, cnic, name, managerID)
We would like to extend the table declaration to enforce that each of id and cnic is a key (by itself), name is mandatory, and each value of managerID must be one of the values that appears in the id attribute of the same table. In addition, cnic attribute must always have 13-digit characters. Write down all the constraints that need to be enforced on Staff table. [3]
- 1.3. Write down the difference between procedural and non-procedural with example.[1]

-----Mapped to CLO2[Apply the concept of domain and tuple relational calculus] -----

Q2) For the following scenario, you are to write relational algebra queries, against the following needs, over a small sample database. The database contains following 3 relations:

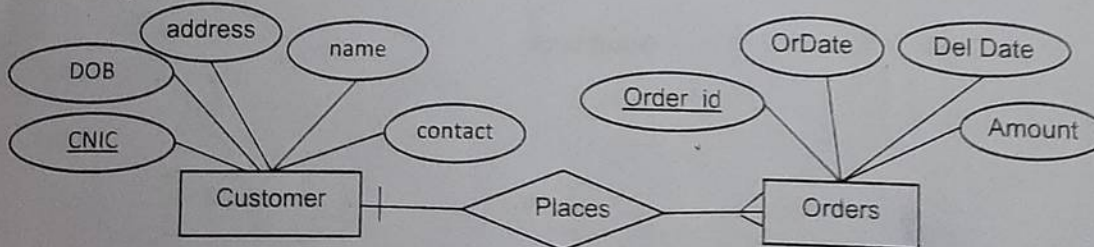
- Suppliers (sid, sname, address)
- Parts(pid, pname, color)
- Catalog(sid, pid, cost)

Answer the following questions using relational algebra queries.

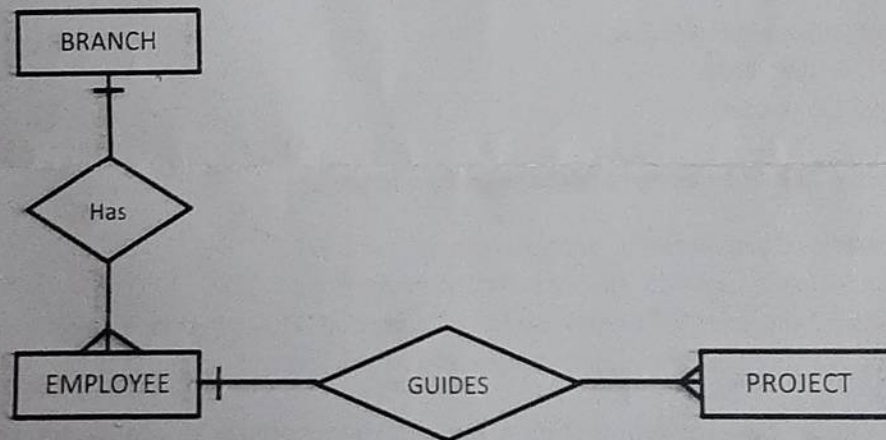
- 2.1. Find the names of suppliers who supply some red parts. [2]
- 2.2. Find the sids of suppliers who supply some red or green parts. [2]
- 2.3. Find the sids of suppliers who supply some red part or are at 221 Packer Av. [2]
- 2.4. Find the sids of suppliers who supply some red part and some green part. [2]

Mapped to CLO3 [Apply data modeling and normalization techniques to design database for small to medium size enterprise]

Q3). Given the following Entity Relationship Diagram (ERD), modify it to include the following additional requirements.



- 3.1. Customer name should contain first name, and last name. [0.5]
a. Write the database schema for the generated ERD in 3.1. [0.5]
- 3.2. If we want to store the age of the customer which can be calculated using date of birth. [0.5]
- 3.3. A customer has more than one contact number, how it would be reflected in ERD. [0.5]
- 3.4. We are going to add information about the products for ordering i.e., we wish to store the complete product details like name, company price etc. Products can be purchased by many customers and a customer can purchase many products. [1]
a. Write the database schema for the generated ERD 3.2 to 3.4. [1]
- 3.5. The products can be an electronic appliance, clothing item, grocery item and can be enlisted as others. Change the ERD obtained in Part 3.4 to Enhanced ERD modeling of this requirement. [1.5]
- 3.6. Electronic items can be purchased in instalments. Every installment has installment number and amount along with date. [1]
- 3.7. Write the database schema for the generated ERD 3.5 to 3.6. [1.5]
- 3.8. Given the following Entity Relationship Diagram (ERD), Identify if there exist any connection traps or not. If yes identify the type of connection trap and reconstruct the given ERD. [2]



Good Luck