CS 303 - Databases & Information Systems
Quiz 1
Time - 60 minutes
Total marks - 30

Instructions:

1. There are 8 questions in this question paper. All questions are compulsory.
2. For each question, please justify how you arrived at your answer. Incomplete answers will lead to loss of marks.
3. Assumptions made in each question should be clearly stated. The assumption should be rational and reasonably accurate. Wild assumptions should not be considered for arriving at an answer.
4. DO NOT COPY.

Questions:

1. Consider the following six relations for an order processing database application in a company: **[6 Marks]**

   Customer (Cust#, Cname, City)
   Order(Order#, Odate, Cust#, Ord_Amt)
   Order_Item(Order#, Item#, Qty)
   Item(Item#, Unit_Price)
   Shipment(Order#, Warehouse#, Ship_date)
   Warehouse(Warehouse#, City)

   Ord_Amt refers to the total dollar amount of an order; *Odate* is the date the order was placed; *Ship_date* is the date an order is shipped from the warehouse; *Cust#* refers to customer number/ID; *Order#* refers to order number/ID; *Item#* refer to Item ID . An order can be shipped from any warehouse. Specify the following queries in relational algebra

   a. List the *Order#* and *Ship_date* for all orders shipped from *Warehouse#* "W2".
   b. List the Warehouse information from which the Customer named "Jose Lopez" was supplied his orders. Produce a listing of Order#, Warehouse#.
   c. List all customer names whose orders were shipped from a warehouse in the same city as they live in.

2. Consider the following relations for a database that keeps track of automobile sales in a car dealership (OPTION refers to some optional equipment installed on an automobile): **[4 Marks]**

   CAR(Serial_no, Model, Manufacturer, Price)
   OPTION(Serial_no, Option_name, Price)
   SALE(Salesperson_id, Serial_no, Date, Sale_price)
   SALESPERSON(Salesperson_id, Name, Phone)

Identify the primary keys in the above schema. Next, specify the foreign keys for this schema, stating any assumptions you make. Next, populate the relations with a few sample tuples, and then give an example of an insertion in the SALE and SALESPERSON relations that violates the referential integrity constraints and of another insertion that does not.

Hint: No need to write SQL queries for this question.

3. Consider the following relations for a database that keeps track of business trips of salespersons in a sales office: **[5 Marks]**

SALESPERSON(P_Id, Name, Start_year, Dept_no)

TRIP(P_Id, From_city, To_city, Departure_date, Return_date, Trip_id)

EXPENSE(Trip_id, Account#, Amount)

P_Id refers to the ID of the salesperson. A trip can be charged to one or more accounts. Specify the primary and foreign keys for this schema, stating any assumptions you make.

Write the corresponding SQL DDL (Create) statements to create the corresponding tables along with the various constraints (entity integrity/ Primary Key, referential integrity, check, not null, etc.) that you have identified above. Please do mention the assumptions that you are making while formulating the create queries.

4. List two reasons why NULL values might be introduced into the database. **[2 Marks]**

5. Give an SQL schema definition for the library database shown below: **[3 Marks]**

member(memb_no, name, age)

book(isbn, title, authors, publisher)

borrowed(memb_no, isbn, date)

Memb_no refers to the Id of a given member. Choose an appropriate domain for each attribute, appropriate primary key, appropriate foreign key for each relation schema.

6. With respect to the library database shown above in Q.5, please write SQL queries for the following scenarios: **[4 Marks]**

a. Print the names of members who have borrowed any book published by "McGraw-Hill".
b. Print the names of members who have borrowed all books published by "McGraw-Hill".
c. For each publisher, print the names of members who have borrowed more than five books of that publisher.
d. Print the average number of books borrowed per member. Take into account that if a member does not borrow any books, then that member does not appear in the borrowed relation at all.

7. What is the difference between a key and a superkey? Why do we designate one of the candidate keys of a relation to be the primary key? **[2 Marks]**

8. . Consider a STUDENT relation in a UNIVERSITY database with the following attributes (Name, Roll, landline, Address, Age, Gpa). Note that the landline phone may be from a different city and state (or province). Example: Landline phone of IIT Dharwad is: 2212839, and Landline phone of IIT Bombay is: 25722545. A possible tuple of the relation is shown below:

[6 Marks]

Name	*Roll*	*Landline*	*Address*	*Age*	*Gpa*
William George	2001001	22578000	Tharamani, Pallipattu, Chennai, Tamil Nadu 600113	19	8.75

a. Identify the critical missing information from the Landline attribute. (Hint: How do you call someone who lives in a different state or province?)

b. Would you store this additional information in the Landline attribute or add new attributes to the schema for STUDENT? Justify your answer.

c. Consider the Name attribute. What are the advantages and disadvantages of splitting this field from one attribute into three attributes (first name, middle name, and last name)?

d. Suppose the student can have between 0 and 5 phones. Suggest two different designs of relations/schema that allow this type of information.