University of Strathclyde Glasgow

Department of Computer & Information Sciences

CS990 Database Fundamentals

Monday 15th April 2024 **9.30am - 10.30am**
(Duration: 1 hour)

Attempt all the Questions.

Calculators must not be used to store text and/or formulae nor be capable of communication. Invigilators may require calculators to be reset.

Question 1.

A university library has a database containing information about borrowers, books, and bookloans. Names of the relations are as below:

Borrower(brID, bName, yearBorn, Phone)

Book(bkID, bTitle, publisherName)

Loan(loanID, brID, bkID, outDate, dueDate)

The data is stored in the following three tables with some example data shown:

Borrower

brID	bName	yearBorn	Phone
301	John	1991	023232521
302	Angela	2001	023541587
303	Smith	1999	023465874
304	Stuart	2004	023645832

Book

bkID	bTitle	publisherName
1024	Good Bye!	NormanBell
1090	The Story of Twin City	NormanBell
1092	History 1990	xSprinter
1908	Sydney Bird	xSprinter

Loan

loanID	brID	bkID	outDate	dueDate
101	301	1024	2020-7-11	2020-8-12
111	301	1024	2020-8-14	2020-9-14
122	302	1092	2021-9-29	2021-10-26
133	303	1024	2021-10-30	2021-11-26

a) The library intends to create a database to start recording the data in the tables "**Borrower", "Book"** and "**Loan**" as shown above.

Write an SQL CREATE TABLE statement for the table **Loan** to define the relational schema for library database.

You should assume the following:

- brID, bkID and loanID are all Numbers,
- outDate and dueDate are of the datatype Date.
- Be sure to define any primary keys, foreign keys and any other table constraints.

(4 *marks)*

b) The library intends to gather some information regarding its services, and it needs to know the names of the books **John** and **Angela** borrowed. Write an SQL query that returns the titles of all books borrowed by John and Angela.

(4 *marks)*

c) The library has a new book entitled "Urbanisation" published by Springerlink with **bkID** '1801' available for loan. Write an SQL statement to add this new book as the next record to the library's database.

(*2 marks*)

d) The library intends to update its database as some of the borrowers are old and have ceased to be subscribing members of the library. Write an SQL statement to delete all records of borrowers who were born in and before 1970.

(2 marks)

e) Write an SQL query to find the name of the book which has been borrowed more than two times by someone.

(4 *marks)*

f) The library plans to maintain and update the database and plans to remove any borrowers who haven't been regularly using the services. Write an SQL query (**subquery)** that deletes borrowers who haven't borrowed any book since December 30, 2020.

(4 marks)

Question 2.

Examine the Pets health history data captured from forms recorded over time. The data has been derived in a table as shown below, for the PetPro pets care centre which specializes in the provision of health care for pets. The table captures the medical history and treatment details for each pet visit, allowing veterinarians to track the care provided to each animal over time. Each row in the table represents a specific visit to the veterinarian for a particular pet. In this example: Rover, a 12-year-old dog owned by Sam Cook, visited the veterinarian on multiple occasions.

PET_ID	PET_NAME	PET_TYPE	PET_AGE	OWNER	VISIT_DATE	PROCEDURE
246	ROVER	DOG	12	SAM COOK	Jan 13/2002	01 - rabies vaccination
					Mar 27/2002	10 - examine and treat wound
					Apr 02/2002	05 - heart worm test
298	SPOT	DOG	2	TERRY KIM	Jan 21/2002	08 - tetanus vaccination
					Mar 10/2002	05 - heart worm test
341	MORRIS	CAT	4	SAM COOK	Jan 23/2001	01 - rabies vaccination
					Jan 13/2002	01 - rabies vaccination
519	TWEEDY	BIRD	2	TERRY KIM	Apr 30/2002	20 - annual check up
					Apr 30/2002	12 - eye wash

(a) Identify the functional dependencies represented by the attributes shown in the table given.

(4 marks)

(b) Describe and illustrate the process of normalizing the attributes shown in the above table to produce a set of well-designed 3NF relations.

(6 marks)

(c) Identify the primary and foreign keys in your 3NF relations.

(4 marks)

(d) Draw a simple ERD diagram to show the relationships between the structures identified above.

(6 Marks)

END OF PAPER

(Muhammad Irfan)