Griffith UNIVERSITY

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School of Information and Communication Technology (ICT)

Data Management/Applied Computing

Trimester X, 20xx

Final Exam – Sample Questions

Note: All ERD must be drawn using Crow's Foot Notation

Question 1

Design a logical ERD for the following case study. Use the Crow's Foot notations in your designed ERD.

Case study:

- Acme Pty Ltd is made up of a number of departments that manage none or more projects. Each project belongs to a department.
- Each department employs a number of employees. Each employee works in one department.
- A team of employees work on each project.
- Some employees may not be assigned to any project yet and a new project may not have any team assigned to it.
- One of the team members supervises the other team members on the project.

In particular, in the ERD you need to show:

1. All entities with their attributes, including PK and FK attributes
2. Relationship (with name) between entities.
3. Connectivity and participation between entities.

Insert/attach your ERD as a file (JPG, PNG, or PDF) below. You should use draw.io to draw the ERD.

Question 2

Given this ERD of database below.

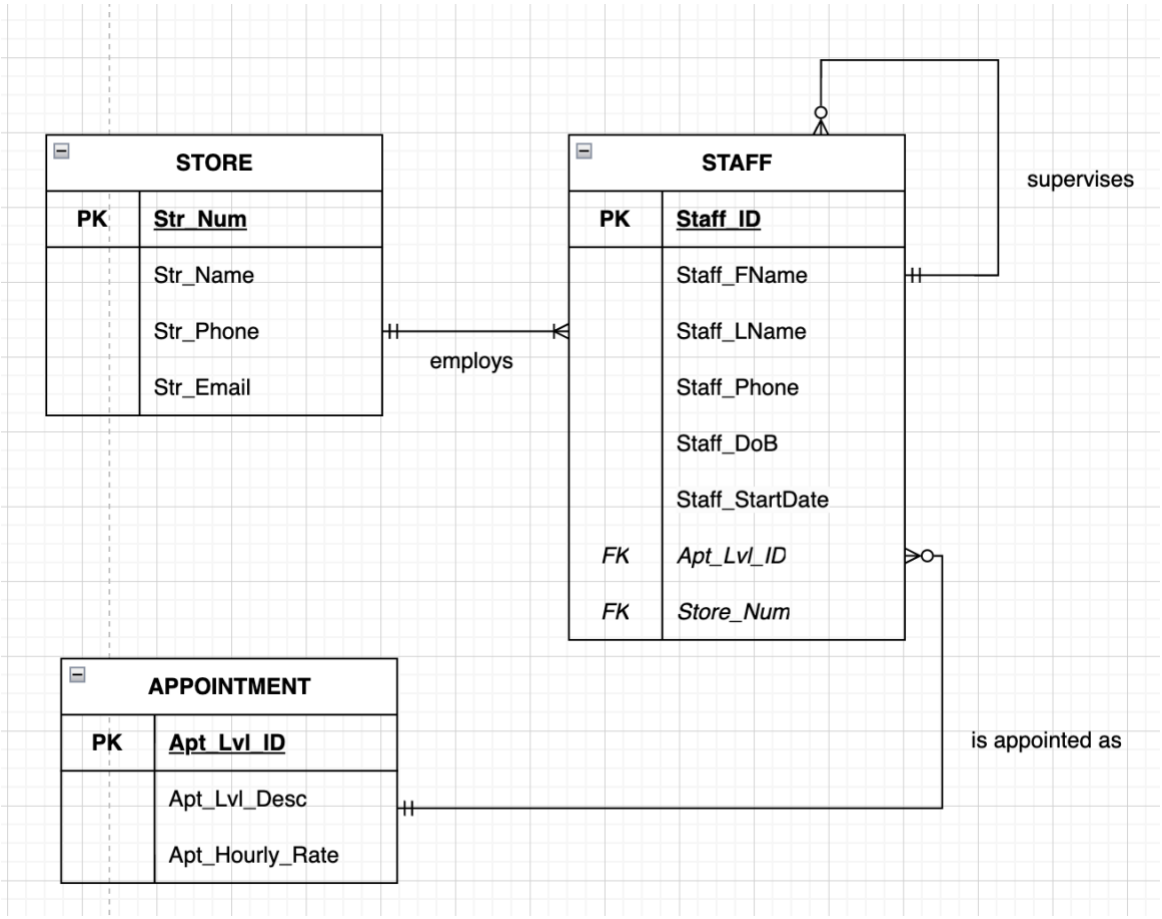


Figure: ERD

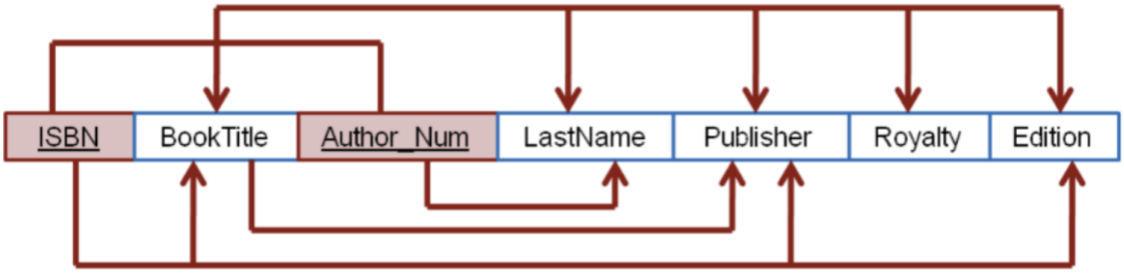
The business rules have changed to match the real-world specifications. Modify the ERD, so that it is optimal and satisfies these requirements:

- A staff can work in multiple stores
- A staff will have a particular role (staff or supervisors) in each store.
- Each store will have different salary rate for the staffs
- The salary rate depends on the appointment level

Question 3

For the table BOOKAUTHOR below you are given the following functional dependencies.

BOOKAUTHOR (ISBN, BookTitle, Author_Num, LastName, Publisher, Royalty, Edition)



Functional dependencies:

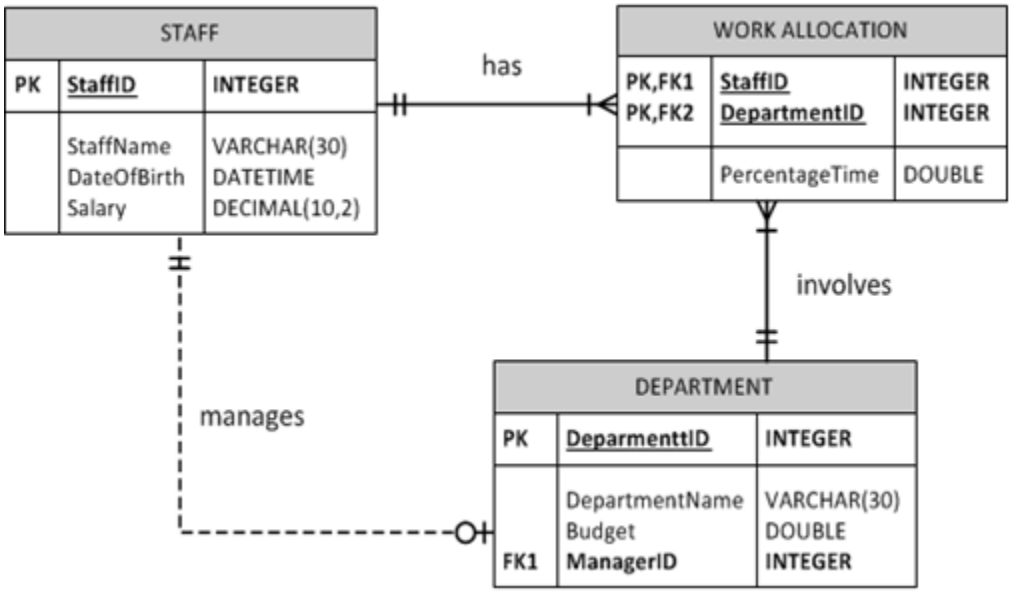
1. ISBN → BookTitle, Publisher, Edition
2. Author_Num → LastName
3. BookTitle → Publisher
4. {ISBN, Author_Num} → BookTitle, LastName, Publisher, Royalty, Edition

Write the types of functional dependencies shown in (1) to (4) above.

Also, decompose and normalise the table and answer which normalisation form that dependency is.

Question 4:

4.1. For the following entity relationship diagram write MySQL code for creation of three tables. You can assume reasonable datatypes and lengths for each attribute



4.2. The book database has the following Relation Schema:

Author (AuthorNum, AuthorLast, AuthorFirst)

Publisher (PublisherCode, PublisherName, City)

Book (BookCode, Title, PublisherCode, DateFirstPublished, Type, Price, Paperback)

Branch (BranchNum, BranchName, BranchLocation, City, NumEmployees)

Inventory (BookCode, BranchNum, OnHand)

Wrote (BookCode, AuthorNum, Sequence)

Using the above schema, write MySQL statements for the following queries:

a. Find the books whose prices are more than the average books price.
b. List publisher names and their locations for those publishers that have the letter r in the third position of their names.
c. List the titles of books and the names of their authors where the book has been published by a publisher located in 'New York' and the branch that holds the book has more than 50 employees.

Question 5 (For students from **1814/2814/7003ICT**):

Provided the case study, determine the most appropriate types of database to use in this case:

Case Study: FurryFriends – Social Platforms for Pet Lovers

FurryFriends is an emerging social media network specifically designed for pet owners. It serves as a dynamic platform where users can share their pet-related experiences, provide tips on pet care, discover pet-friendly places, and facilitate pet adoptions. Additionally, the network connects users with various pet care services like grooming and veterinary assistance. As FurryFriends continues to expand, the startup faces the critical task of selecting a database that will optimally support its growing and diverse data needs.

Data Requirements:

1. The database should support embedded documents for efficient access patterns, such as embedding a pet's medical records directly within the pet's profile, while also allowing for simple linking where necessary
2. The nature of FurryFriends involves a diverse and continually evolving set of data attributes. User profiles, pet profiles, and content types (posts, images, videos) may all vary significantly. For example, pet profiles might include an array of unique attributes such as breed-specific traits, medical histories, dietary needs, or training records, which can differ markedly from one pet to another. The database should allow for the easy addition, modification, and removal of these attributes without the need for extensive database restructuring.
3. The platform will handle a substantial volume of unstructured data, including free-form text posts, multimedia files like photos and videos, and user comments.
4. Given the rapidly changing landscape of a social media platform, the database should offer high flexibility to adapt to changes in data structure and user requirements.

Task: As a database consultant, you are tasked with determining which type of database should be used for this general case.

Your colleague A argues that using SQL database is a good choice for this case, whereas colleague B saying Document database is a better match. Explain the strength and weakness of those two choices. Which types of database would you pick?

Question 5 (For students from **1011ICT**)**:**

Draw the BPMN process for the case below, starting from “Claim registered”.

“After a claim is registered, a claims officer reviews it and prepares a settlement recommendation. This recommendation is then entered into an IT system, which evaluates it and labels the claim as either "OK" or "Not OK," based on the presence of any errors. If the claim is marked "Not OK," it is returned to the claims officer, and the process is repeated. If the claim is marked "OK," it is marked as ready for reimbursement.”

Question 6

Scenario:

- JBHiTech is the chain of phone retail stores that sells phones
- There are many types of phone brands, such as Apple, Samsung,…

Design a most logical ERD for the scenarios, fulfil these requirements/questions from our stakeholders:

- If a customer want to return a product, how do we use serial number of a phone to track if the product belong to the store and also trace back which order number and store that products belong to?
- How to track the date that a particular product arrived in the store?
- A generation of iPhone will have multiple versions (E.g. iPhone 15, iPhone 15 Pro, iPhone 15 Pro Max). Each phone will have different storage memory and colours (e.g. 64GB/128GB etc.; Blue/Black/Pink…)
- We need to know which customer bought which phones in which store.

In particular, in the ERD you need to show:

1. All entities with their attributes, including PK and FK attributes
2. Relationship (with name) between entities.
3. Connectivity and participation between entities.

Insert/attach your ERD as a file (JPG, PNG, or PDF) below. You should use draw.io to draw the ERD.

Question 7

Let's assume you have two tables:

- Orders (OrderID, CustomerID, OrderDate, TotalAmount)
- Customers (CustomerID, CustomerName, CustomerCity)

Which query below is more optimized than the others? Explain your reasonings.

Query one:

```
SELECT Customers.CustomerName, Orders.OrderDate, Orders.TotalAmount
FROM (SELECT * FROM Customers WHERE CustomerCity = 'New York') AS Customers
INNER JOIN (SELECT * FROM Orders WHERE TotalAmount > 100) AS Orders
ON Customers.CustomerID = Orders.CustomerID;
```

Query two:

```
SELECT Customers.CustomerName, Orders.OrderDate, Orders.TotalAmount
FROM Customers
INNER JOIN Orders ON Customers.CustomerID = Orders.CustomerID
WHERE Customers.CustomerCity = 'New York' AND Orders.TotalAmount > 100;
```

Question 8

Draw an ERD for the following scenario.

- A laboratory employs multiple chemists, each of whom may work on one or more projects. Chemists may also utilize specific equipment for each project.
- The CHEMIST entity has attributes such as EMPLOYEE_ID (unique identifier), Name, and Phone_No.
- The PROJECT entity has attributes including Project_ID (identifier) and Start_Date, while EQUIPMENT has attributes like Serial_No and Cost.
- The organization aims to track Assign_Date, which is the date when a particular piece of equipment is assigned to a chemist for a specific project.
- A chemist must be involved in at least one project and use at least one piece of equipment. However, a piece of equipment does not necessarily have to be assigned, and a project might not have a chemist or equipment assigned to it.

Question 9

Pants-R-Us is a leading company in the apparel industry, specializing in the innovation, design, and production of high-quality branded and private-label pants for retailers. The company sells its products to major retailers, who then distribute them through their own stores located in prominent cities and shopping malls. Their main product lines include dress and casual pants for both men and women, which are marketed under well-known national brands.

Currently, Pants-R-Us is working on designing a database system, and the following information has been provided to create an entity-relationship model for the database.

Combine the information from a) and b), draw the corresponding ERD (you don't need to do a) and b) seperatedly).

a) Develop the entities and relationships that correspond to the following rules:

(1) Pants-R-Us classifies its product line as "Styles." Each style is a design classification for a stock-keeping unit (SKU) where the SKU is the basic style in a particular color, waist, and length. Each style may have zero, one, or many SKUs, but an SKU is a member of only one style category.

(2) Pants-R-Us has created several unique colors for its pants. Each color is uniquely identified by a color_id. A color may be used in zero, one, or more SKUs, but each SKU has only one color. Some colors have been created that have not been assigned to an SKU and may never be used.

(3) The retailers who sell the products are the customers of Pants-R-Us. Customers will contract with Pants-R-Us based on styles it will distribute. A customer may distribute one or more styles for Pants-R-Us, and a particular style may be distributed by more than one customer.

(4) Customers have stores, which is the place where they sell the pants and other products. A customer may have one or more stores. To identify a store in the Pants-R-Us database for shipping purposes, all customers have agreed to provide their store_id to Pants-R-Us.

(5) SKUs are inventoried at the stores of the customers. A store will inventory one or more SKUs and each SKU may be inventoried in zero, one or more stores.

b) The following is a list of attributes. Assign each attribute to the appropriate entities. If a composite entity has to be introduced in order to assign an attribute, name that composite entity. Indicate which attributes are key attributes.

STYLE_ID — A unique identifier of a style of pants

STYLE_DESCRIPTION — A description of a style (e.g., "Loose Fit Denim," or "Pleated

Cuffed Pants")

CUST_ID — Unique identifier of a customer of Pants-R-Us

CUST_NAME — The name of the company that is the customer

CUST_ADDRESS — The address of the company that is the customer

STORE_ID — The identifier of the customer's store as provided by the customer

STORE_ADDRESS — The address of the store

COLOR_ID — Unique identifier of a color

COLOR_DESC — Description of a color (e.g., navy, indigo, stone)

UPC — Universal product code, which is a unique identifier of an SKU

WAIST — The waist dimension of an SKU

LENGTH — The length dimension of an SKU

Pants-R-Us will receive actual point-of-sales data by SKU from the customers' stores and keeps track of the stores' inventory positions.

STD_SALES — Customer sales to date from the store location

STD_RETURNS — Cumulative returns to date from the store

ON_HAND — The amount of On_Hand units of inventory of an SKU in a store

IN_TRANSIT — The number of units of inventory of an SKU that has been shipped to a store but not yet received

ON_ORDER — The number of units of an SKU ordered by a store but not yet shipped