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SQL: Database Foundations: Sections 1, 2, 3, 4 : Intro, Modeling, Data Modeler

1-1: Introduction to the Course

- Course goals: create physical model from logical model (ERD)
- Write, execute, and save SQL statements in Oracle Application Express

1-2: Introduction to Database Practices

1. ABC School District would like to create a student on-line information and registration system to capture student-related information. The system needs to be designed as an on-line process to allow all new students to register on-line. It should also allow existing students to update and review all information. Create a list of important data that would need to be captured and stored in the student registration database
    a. Name
    b. Date of birth
    c. Student ID
    d. GPA
    e. Class standing
    f. Credits
    g. Courses
2. XYZ community would like to create a library management system. The objective is for the database to handle all transactions for the library. The database needs to store all the data that is relevant to managing the books, managing customers, and the day-to-day activities of the library. Create a list of important data that would need to be captured and stored in the library management database.
    a. Librarian name
    b. Customer name, address, contact information
    c. Book ID
    d. Book Title and author
    e. Date of borrowing and due date for return

1-3: Types of Database Models Practices

1. Hierarchical Model
2. Network model
3. Object oriented model
4. Relational model
5. Flat file model

1-4: Business Requirements Practices

1.
    a. Business rule: members will have to pay membership fee
    b. Constraint: Only 3 types of memberships for now - corporate, student, and individual

a. Business rule: The membership is free for students. Corporate and individuals will have to pay a fee.
b. Constraint: the membership can only be changed if sufficient justification is provided.

2.

a. Business rule: every doctor has a unique ID that starts with letter “DC”
b. Constraint: Each doctor that is registered has a minimum 7 years working experience

a. Business rule: Every patient is assigned a unique patient number starting with the letters “PT”
b. Constraint: The patients ID is registered upon the patients first visit.

2-1 : Relational Databases Practices

1.

- Book table
  - Title
  - ISBN
  - Year
  - Price
  - Author
  - Publisher
- Author
  - Name
  - Address
  - URL
- Publishers
  - Name
  - Address
  - Phone number
  - URL
- Warehouses
  - Code
  - Address
  - Phone number
- Customers
  - Name
  - Address
  - Email id
  - Phone number

2.

- Orders

        - Customer name
        - Invoice
        - Delivery status
        - Quantity in stock
        - Reorder level
- Invoices
    - Payment status
    - Order quantity
    - Date
    - Total

2-2: Conceptual and Physical Data Models Practices

1. Easily document important entities
2. Identifies how they relate to each other
3. Capture the functional and informational needs of a business
4. Based on current needs but may reflect future needs
5. Addresses the needs of a business

- Conceptual model
    - Focuses on important entities
    - Emphasizes relationships among entities
- Physical model
    - Entity relationship diagram
    - Entity relationship model

2-3 : Entities and Attributes Practices

1. With the information provided above, identify and create the entities for the School Management System.
    a. School
    b. Department
    c. Courses
    d. Faculty
    e. Attendance
    f. Exams
2.
    a. Course
        i. Course ID *
        ii. Course name *
        iii. Credits *
        iv. Description o
    b. Department
        i. Department ID *
        ii. Department name *

iii. Department head o

c. Student
    i. Student ID*
    ii. Student name*
    iii. Date of birth*
    iv. Address*
d. Faculty
    i. Faculty ID*
    ii. Faculty name *
    iii. Classroom o
e. Academic session
    i. Session ID*
    ii. Session name*
    iii. Start date*
    iv. End date*
f. Parent information
    i. Parent name*
    ii. Parent date of birth o
    iii. Address o
g. Exam
    i. Exam name*
    ii. Course name *
    iii. Exam date*

2-4 : Unique Identifiers Practices

1. Search the song's unique identifier. The identifier would be the song title and artist name
2. The student ID would allow you to pick a single student from the rest of the class
3. Student id, title, number

- Student
    - unique identifier: Student ID
    - Candidate: email
- Movie
    - Title
    - Date released
- Locker
    - Locker number
    - Size and location

2-5 : Relationships Practices

1. B. Each EMPLOYEE must be assigned to one and only one DEPARTMENT. Each DEPARTMENT must be responsible for one or more EMPLOYEEs
2. One person is may be born in many different towns
3. Many people may be living in their hometown

4. Many people may be visitors from many other towns
5. The town may be governed by a mayor

- Each course is offered by one department; one department can offer multiple courses
- Each faculty belongs to one department; one department can have multiple faculties
- Each student has one or more parent information records; one parent information record can be linked to multiple students
- Each student can enroll in multiple courses; one course have multiple students enrolled
- Each course can have one or more exams; one exam is associated with one course
- Each academic session includes multiple courses; each course is part of one academic session
- Each exam is conducted in one academic session; one academic session can have multiple exams

2-6 : Entity Relationship Modeling (ERDs) Practices

1. Department
    a. Name
    b. Supervisor
    c. Employee
2. Employee
    a. Name
    b. Project
3. Project
    a. Project ID
    b. Name

Hairstylist< —>> Client –>>Appointment <<-->Hairstylist

Hair Stylist

- First name*
- Last name*
- Address*
- Phone number*
- SSN*
- Salary *

Client

- First name*
- Last name*
- Phone number *
- Specific stylist o

ERDish

- A hairstylist can serve multiple clients and client may be served by one hairstylist
- A client can be assigned to one hairstylist but may change to another hairstylist for future visits

- Each client can have zero or more appointments
- A hairstylist can perform one or more appointments

Teacher
- First name*
- Last name*
- address*
- Phone number*
- Email*

Course
- Code*
- Teacher*

Class
- Unique ID*
- Day*
- Time*
- Classroom*

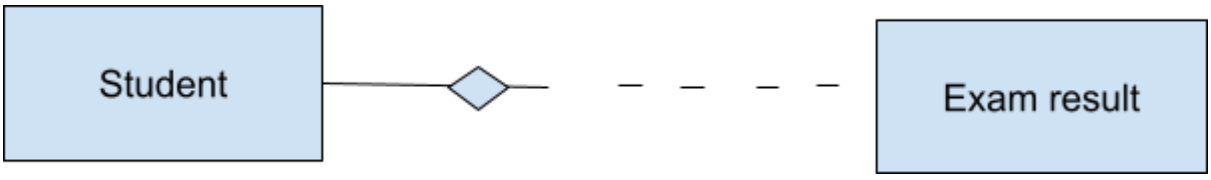
Teacher-Class
- A teacher can be assigned up to 3 classes per semester. A class must have one teacher

Course - class
- A course can be offered in multiple classes, and a class must belong to one course

3-1: More with Relationships Practices

1.
1. Enrollment
2. Course assignment
3. Exam registration

2



3. Faculty
   a. #ID
   b. *First Name
   c. *Last Name
   d. *Email
   e. *Login Date
   f. *Login TIme
   g. o Details

Full time faculty
a. *salary
b. *insurance plan

Part time faculty
a. *hourly rate

4 Course
- #ID
- Course name

Seated
- Building name
- Room number
- Date
- TIme

Online
- Logon id
- Password

Course entity is connected to offered as arc. THe offered as arc connects to seated and online. The arc indicates that a course must be either online or seated which ensures exclusivity.

5.

Hotel
- Hotel ID
- Name
- Address

FLoor
- Floor ID
- Floor number
- Hotel ID

Suite
- Suite ID
- Suite number
- Floor ID

Room
- Room ID
- Room number
- Suite ID

Relationships
- Hotel to floor: one to many; floor to suite: one to many; Suite to room: one to many

3-2: Tracking Data Changes Practices

1. Df

a. Student
    i. ID
    ii. First name
    iii. Last name
    iv. Email
b. Course
    i. ID
    ii. Name
    iii. Course description
c. Student course detail
    i. Detail ID
    ii. Student ID
    iii. Course ID
    iv. Grade
    v. Grade date

Relationship - student to student course detail: a student can have multiple course details
Course to student course detail - a course can have multiple student course details

2.

a. Start time helps ensure that each assignment instance is unique. It helps prevent duplicate entries for assignments that occur at different times
b.
    i. End time must be later than start time; Yes, this constraint represents conditional non-transferability. If the classroom is not available during the desired time, the assignment cannot be scheduled in that classroom, and the assignment's scheduling cannot be transferred to that time slot.
    ii. An assignment cannot be scheduled in a classroom if the classroom is already occupied during that time. Yes, this constraint represents conditional non-transferability. If the classroom is not available during the desired time, the assignment cannot be scheduled in that classroom, and the assignment's scheduling cannot be transferred to that time slot.
    iii. An assignment for a given classroom should not overlap with other assignments or exams in the same classroom. Yes, this constraint represents conditional non-transferability. If there is an overlap, the assignment cannot be scheduled without resolving the conflict, making it impossible to transfer or reschedule without addressing the overlap issue.

3-3: Normalization and Business Rules Practices

1. Broke down color column so that each row contains only one color per item. Then I created a new table that separates the repeating groups into a new table. Table 1 will have atomic values for unit price and item ID
    a. Table 2 will list each color associated with Item ID
2. Created 2 tables to normalize. One table for Store which contains the store ID and location. The other table will contain supplier ID and store ID

3. Created two separate stables. One table with category and category ID and category description and another table for book with book ID, category ID, and price

Exercise 3:

User Table: Stores user-specific information.
Message Table: Stores details about each message, with a foreign key linking to User.
Server Table: Stores server details.
Message-Server Table: Maps messages to servers, linking Message and Server.

Exercise 4:
Customers:

- Each customer is identified by a unique ID.
- Each customer has a name, address, email ID, and phone number.

Shopping Carts:

- Each customer can have multiple shopping carts.
- Each shopping cart is identified by a unique Shopping_Cart_ID.
- Each shopping cart contains one or more books, with the option to have multiple copies of the same book.

Order Information:

- When placing an order, customers must provide billing and shipping addresses, select a shipping option, and provide payment information (e.g., credit card number).
- An email notification is sent to the customer when an order is placed.

2.

All teachers in our school must possess a valid teaching certificate

- Structural Business Rule: This rule defines a requirement related to the structure or qualification of teachers within the organization.

Each Department must offer a Course

- Structural Business Rule: This rule outlines the organizational structure by specifying a requirement for departments to offer courses.

Approval of travel requests to an event must be signed by the project manager of the event

- Procedural Business Rule: This rule describes a procedure or process for approving travel requests, specifying who must approve them.

A customer may make numerous payments on account

- Programmatic Business Rule: This rule deals with how customer payments are handled in a system, focusing on the functionality of tracking multiple payments.

A machine operator may not work more than 10 hours in a day

- Procedural Business Rule: This rule defines a procedure for work hours and compliance with labor regulations.

The Rental amount in RENTAL is calculated from the Rental rate multiplied by the number of days

- Programmatic Business Rule: This rule involves the calculation logic used in the system to determine rental amounts.

A Customer can have zero, one, or many ORDERS

- Structural Business Rule: This rule defines the relationship between a customer and their orders, establishing the structure of data.

The Total cost of the RENTAL is calculated from the sum of Insurance amount, Rental amount, and Late charge

- Programmatic Business Rule: This rule specifies the calculation logic for the total rental cost in the system.

A customer's debt must not exceed the customer's credit limit

- Programmatic Business Rule: This rule involves the system's functionality to ensure that customer debt does not surpass their credit limit.

3-4: Data Modeling Terminology and Mapping Practices

1.
    a. Attribute - Column
    b. Entity - Table
    c. ER Model - Physical design
    d. Instance - Row
    e. Primary UID - Primary key
    f. Relationship - Foreign key
    g. Secondary UID - Unique key

2.
    a. Pk - primary key
    b. Fk - foreign key
    c. Uk - unique key
    d. * - mandatory

e. O - optional

3.
   a. Auth
   b. Publ
   c. Cust

4.
   a. Title: song
   b. Description: song
   c. Venue: event
   d. First Name: customer
   e. Phone Number: customer
   f. Release Date: song
   g. Last Name: customer
   h. Type: song
   i. Email Address: customer
   j.