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| **Assignment 2 : EER Diagram** |
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**Subject - DBMSL**

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|  | **Theory Questions** |
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|  | Q.1 Explain the need of EER diagrams. |

Ans -> An Entity-Relationship Diagram (ERD) serves as a visual tool in database design, offering a graphical representation of the database structure. Its importance lies in various aspects:

Visualizing Database Structure: EER diagrams offer a succinct and comprehensible visual depiction of the data model, aiding in the interpretation of the database structure.

Analysis of Requirements: EER diagrams play a crucial role in the early stages of database design by helping to analyze and comprehend the data requirements of the system. They facilitate the identification of entities, attributes, and relationships that must be incorporated into the database.

Facilitating Database Design: EER diagrams lay the groundwork for crafting the database schema. Designers leverage the insights provided by the diagram to construct tables, establish relationships, and define constraints within the database.

Ensuring Data Integrity: EER diagrams are instrumental in enforcing data integrity constraints. By visually representing relationships between entities, designers can specify and implement constraints to uphold the accuracy and consistency of data in the database.

Database Management: Database administrators find EER diagrams indispensable for gaining insights into the overall database structure, aiding in effective database management.

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| Q.2 Explain in detail Generalization, specialization and Aggregation and how do we convert them into relational model. |
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Generalization, Specialization, and Aggregation in Database Design: Generalization:

Definition: Represents a higher-level entity (superclass) to capture common characteristics of multiple lower-level entities (subclasses).

Example: Superclass - Vehicle, Subclasses - Car, Truck, Motorcycle. Relational Model: Corresponding tables with common attributes in the superclass table and specific attributes in subclass tables.

Specialization:

Definition: Defines subtypes or subclasses based on attributes specific to a subset of instances of the parent class.

Example: Superclass - Employee, Subclasses - Manager, Programmer, HR. Relational Model: Tables for each entity, with common attributes in the general table and specific attributes in subclass tables.

Aggregation:

Definition: Represents a "whole-part" relationship where one object contains or is composed of other objects.

Example: Aggregate - University, Components - Departments, Students, Faculty. Relational Model: Separate tables for the whole and its parts, with foreign keys in part tables referencing the whole.

Converting to Relational Model:

Generalization/Specialization: Use separate tables for the general entity and specialized entities, including common and specific attributes.

Aggregation: Represent the whole and its parts using separate tables, with foreign keys linking part tables to the whole.

In summary, these concepts help visualize and structure the database, providing

clarity in requirements analysis, database design, and ensuring data integrity. The relational model captures these relationships with tables and foreign keys.

Implementation question

Q1) Draw the EER for SIU library management and convert it into a relational model.

| **EER Diagram** |
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**1. InstituteLibrary:**

| ● Attributes: Institute\_ID (Primary Key), Institute\_Name, Dean\_Name ● Sample Data: |
| --- |

| **Institute\_ID** |  | **Institute\_Name** |  | **Dean\_Name** |
| --- | --- | --- | --- | --- |
| 1 |  | SIU Institute |  | Dr. Smith |
| 2 |  | XYZ Institute |  | Prof. Johnson |
| 3 |  | ABC University |  | Dr. Anderson |
| 4 |  | LMN College |  | Prof. Davis |
|  |  | |  |  |

| **2. IndividualLibrary:** | |
| --- | --- |
|  | ● Attributes: Library\_ID (Primary Key), Library\_Name, Location, Institute\_ID (Foreign Key)  ● Sample Data: |

| **Library\_ID** |  | **Library\_Name** |  | **Location** |  | **Institute\_ID** |
| --- | --- | --- | --- | --- | --- | --- |
| 101 |  | Main Library |  | Main Street |  | 1 |
| 102 |  | Campus Library |  | University Campus |  | 1 |
| 103 |  | Downtown Library |  | Downtown Branch |  | 2 |
|  |  |  |  |  |  |  |
| 104 |  | Community Library |  | Community Center |  | 3 |

| **3. Member:** | |
| --- | --- |
|  | ● Attributes: Member\_ID (Primary Key), Name, Address  ● Sample Data: |

| **Member\_ID** | **Name** | | **Address** | |
| --- | --- | --- | --- | --- |
| 201 |  | John Doe |  | 123 Main St. |
| 202 |  | Jane Smith |  | 456 Oak Ave. |
| 203 |  | Mark Johnson |  | 789 Pine Rd. |
| 204 |  | Emily Williams |  | 101 Cedar Lane |
|  |  | |  |  |

| **4. Student:** | |
| --- | --- |
|  | ● Attributes: Member\_ID (Primary Key, Foreign Key), Year  ● Sample Data: |

| **Member\_ID** | **Year** |
| --- | --- |
| 201 | Freshman |
| 202 | Senior |
| 203 | Sophomore |
|  |  |
| 204 | Junior |

| **5. Teacher:** | |
| --- | --- |
|  | ● Attributes: Member\_ID (Primary Key, Foreign Key), Department ● Sample Data: |

| **Member\_ID** |  | **Department** |
| --- | --- | --- |
| 205 |  | Mathematics |
| 206 |  | History |
| 207 |  | Physics |
| 208 |  | Chemistry |

| **6. Book:** | |
| --- | --- |
|  | ● Attributes: ISBN (Primary Key), Genre, Price  ● Sample Data: |

| **ISBN** | **Genre** |  | **Price** |
| --- | --- | --- | --- |
| 978-123456789 | Mystery |  | 19.99 |
| 978-987654321 | Sci-Fi |  | 24.99 |
| 978-456789012 | Fantasy |  | 14.99 |
| 978-345678901 | Non-Fiction |  | 29.99 |
|  |  |  |  |

| **7. Author:** | |
| --- | --- |
|  | ● Attributes: Author\_ID (Primary Key), Author\_Name, Awards  ● Sample Data: |

| **Author\_ID** |  | **Author\_Name** |  | **Awards** |
| --- | --- | --- | --- | --- |
| 301 |  | J.K. Rowling |  | Bestseller Award |
| 302 |  | Stephen King |  | Literary Medal |
| 303 |  | Agatha Christie |  | Mystery Writers Award |
| 304 |  | George Orwell |  | Dystopian Fiction Prize |
|  |  |  |  |  |

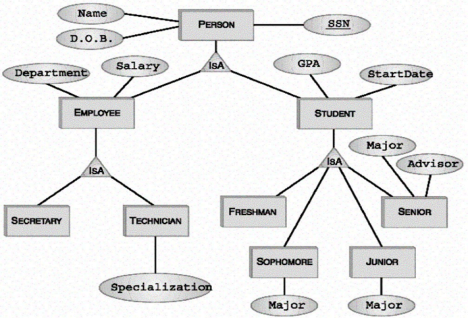
| **8. Publisher:** | |
| --- | --- |
|  | ● Attributes: Publisher\_ID (Primary Key), Name, Address  ● Sample Data: |

| **Publisher\_ID** |  | **Name** | **Address** |
| --- | --- | --- | --- |
| 401 |  | ABC Publishers | 123 Publishing St. |
| 402 |  | XYZ Publications | 456 Book Avenue |
| 403 |  | Book Haven | 789 Literature Lane |
|  |  |  |  |
| 404 |  | Paperback Press | 101 Print Street |

| **9. Seller:** | |
| --- | --- |
|  | ● Attributes: Seller\_ID (Primary Key), Seller\_Name, Seller\_Company ● Sample Data: |

| **Seller\_ID** | **Seller\_Name** |  | **Seller\_Company** |
| --- | --- | --- | --- |
| 501 | Books R Us |  | XYZ Corporation |
| 502 | Page Turners |  | ABC Books Inc. |
| 503 | Quick Reads |  | Rapid Publications |
| 504 | Novel Express |  | Fast Book Co. |

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|  | Q2) Convert following EER to relational model |

Relational Schema

**PERSON**

| **SSN** | **Name** |  | **D.O.B** |
| --- | --- | --- | --- |
| 456-78-9012 | John Doe |  | 12-01-1956 |
| 123-45-6789 | D.B.Cooper |  | 15-04-1963 |
| 234-56-7890 | Mark Wood |  | 20-08-1967 |
| 345-67-8901 | Steve Smith |  | 05-05-1980 |

| **EMPLOYEE** | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SSN** | **Department** | | | | |  | **Salary** |  |
| 456-78-9012 | HR | | | | |  | 50000 |  |
| 123-45-6789 | Aerospace | | | | |  | 200000 |  |
| 234-56-7890 | Finance | | | | |  | 80000 |  |
| 345-67-8901 | Marketing | | | | |  | 15000 |  |
|  |  | | | | |  |  |  |
| **STUDENT** | | | | | | | | |
| **SSN** | | **GPA** | |  | **StartDate** | | |  |
| 456-78-9012 | | 8.3 | |  | 12-01-2023 | | |  |
| 123-45-6789 | | 9.5 | |  | 15-04-2022 | | |  |
| 234-56-7890 | | 4.7 | |  | 20-08-2024 | | |  |
| 345-67-8901 | | 7.9 | |  | 05-05-2023 | | |  |
|  | |  | |  |  | | |  |
| **SECRETARY** | | | | | | | | |
| **SSN** | | | | | | | |  |
| 456-78-9012 | | | | | | | |  |
| 123-45-6789 | | | | | | | |  |
| 234-56-7890 | | | | | | | |  |
| 345-67-8901 | | | | | | | |  |
|  | | | | | | | |  |
| **TECHNICIAN** | | | | | | | | |
| **SSN** | | | **Specialization** | | | | |  |
| 456-78-9012 | | | Networking | | | | |  |
| 123-45-6789 | | | Database | | | | |  |
| 234-56-7890 | | | Security | | | | |  |
| 345-67-8901 | | | Software | | | | |  |
|  | | |  | | | | |  |
| **FRESHMAN** | | | | | | | | |
| **SSN** | | | | | | | |  |
| 456-78-9012 | | | | | | | |  |
| 123-45-6789 | | | | | | | |  |
| 234-56-7890 | | | | | | | |  |
| 345-67-8901 | | | | | | | |  |

| **SOPHOMORE** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SSN** | | |  | **Major** | | |  |
| 456-78-9012 | | |  | Biology | | |  |
| 123-45-6789 | | |  | AIML | | |  |
| 234-56-7890 | | |  | Economics | | |  |
| 345-67-8901 | | |  | Computer Science | | |  |
|  | | |  |  | | |  |
| **JUNIOR** | | | | | | | |
| **SSN** | | |  | **Major** | | |  |
| 456-78-9012 | | |  | Computer Science | | |  |
| 123-45-6789 | | |  | AIML | | |  |
| 234-56-7890 | | |  | Physics | | |  |
| 345-67-8901 | | |  | Biology | | |  |
|  | | |  |  | | |  |
| **SENIOR** | | | | | | | |
| **SSN** | **Major** | | | | **Minor** | |  |
| 456-78-9012 |  | Biology | | |  | Computer Science |  |
| 123-45-6789 |  | AIML | | |  | Cloud |  |
| 234-56-7890 |  | Economics | | |  | Physics |  |
| 345-67-8901 |  | Computer Science | | |  | Biology |  |
|  | | | | | | | |