

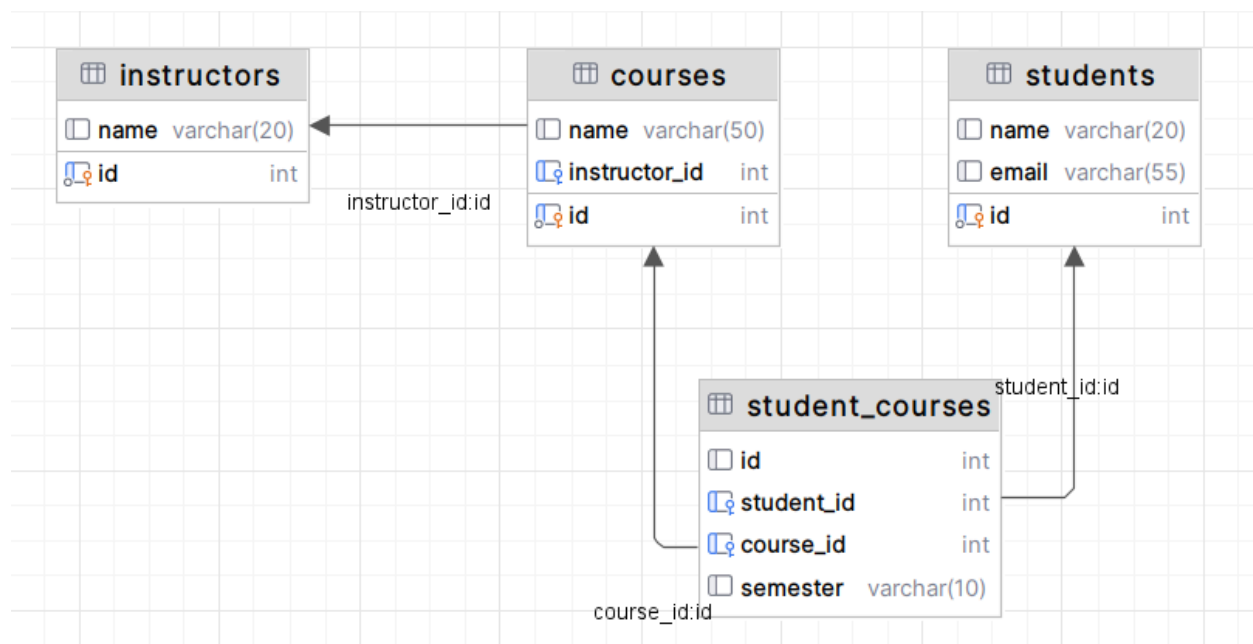
02. Introduction to Data Modeling - SOLUTIONS

Task 1

1. Consider a denormalized table storing information about students, courses and instructors.

Student_id	student_name	student_email	course_id	course_name	instructor_id	instructor_name	semester
101	John Doe	john.doe@example.com	CSE201	Databases	501	Dr. Smith	Fall 2025
102	Jane Smith	jane.smith@example.com	CSE202	Programming I	502	Dr. Johnson	Fall 2025
101	John Doe	john.doe@example.com	CSE202	Programming I	502	Dr. Johnson	Fall 2025
103	Sarah Lee	sarah.lee@example.com	CSE201	Databases	501	Dr. Smith	Fall 2025
104	Amir K	amir.k@example.com	CSE203	Web Development	503	Dr. Brown	Spring 2026

SOLUTION

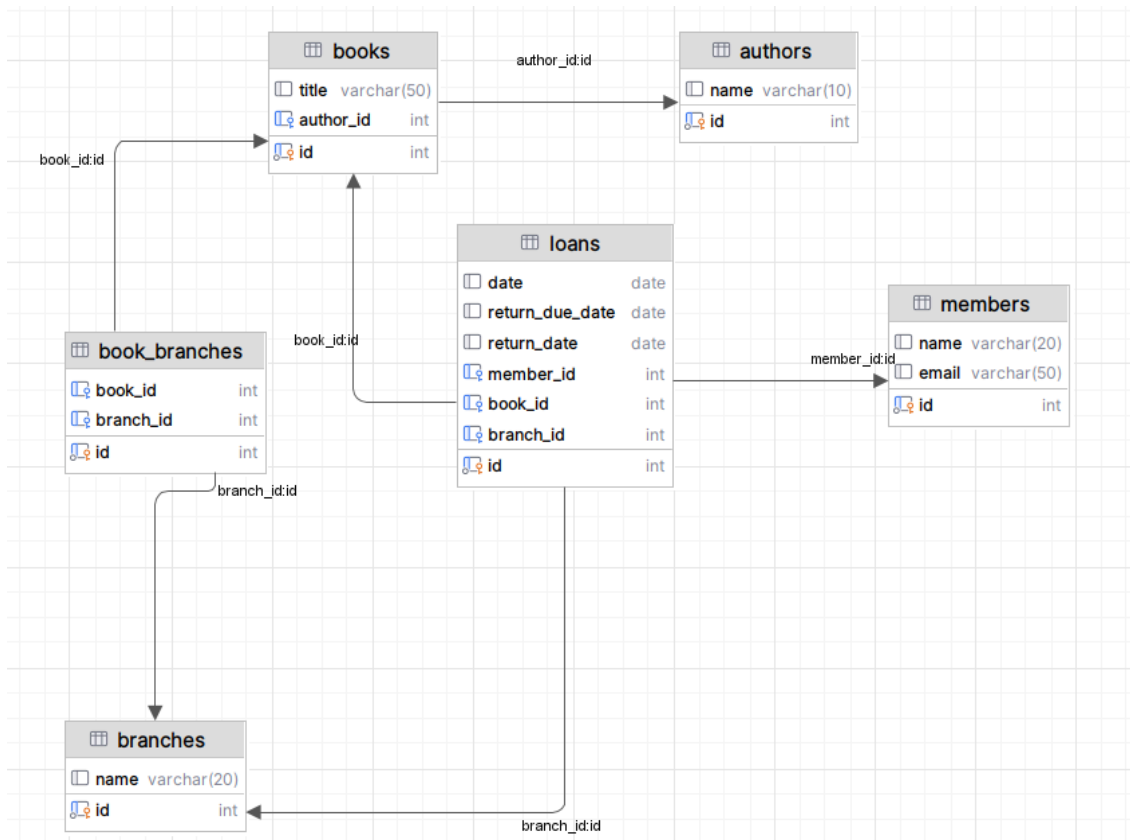


Task 2

2. You have a denormalized table storing information about the library.

loan_id	loan_date	return_due_date	return_date	member_id	member_name	member_email	book_id	book_title	author_id	author_name	branch_id	branch_name
7001	2025-02-10	2025-02-24	2025-02-22	101	John Doe	john.doe@example.com	2001	Database Systems	501	C. J. Date	10	Central
7002	2025-02-11	2025-02-25	2025-02-23	102	Jane Smith	jane.smith@example.com	2002	Clean Code	502	Robert Martin	10	Central
7003	2025-02-11	2025-02-25	NULL	101	John Doe	john.doe@example.com	2003	Design Patterns	503	GoF	11	West Branch
7004	2025-02-12	2025-02-26	NULL	103	Sarah Lee	sarah.lee@example.com	2002	Clean Code	502	Robert Martin	11	West Branch

SOLUTION

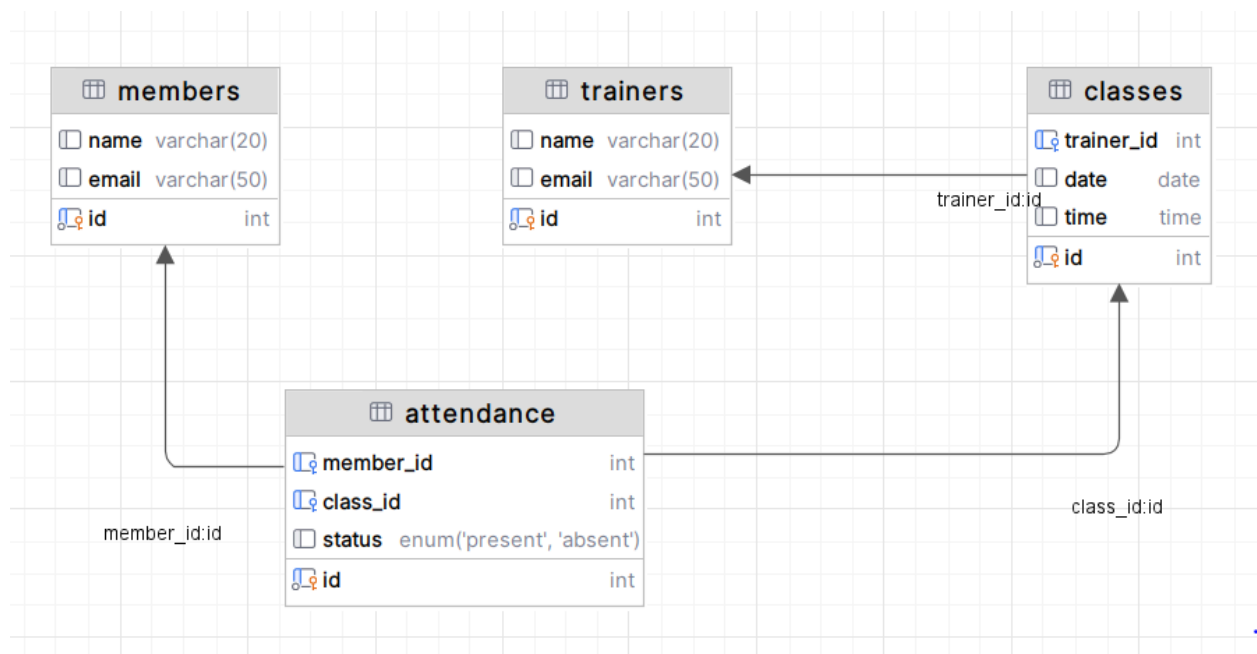


Task 3

3. You are building a database for a gym to manage members, fitness classes, and trainers. A member can attend many classes, and each class can have many members. A trainer can lead many classes, but each class is led by exactly one trainer. The system should support scheduling (date/time), capacities, and attendance tracking.

- Draw/describe the ER model with cardinalities.
- List main entities with key attributes.
- Produce a 3NF relational schema (PKs, FKs).

SOLUTION

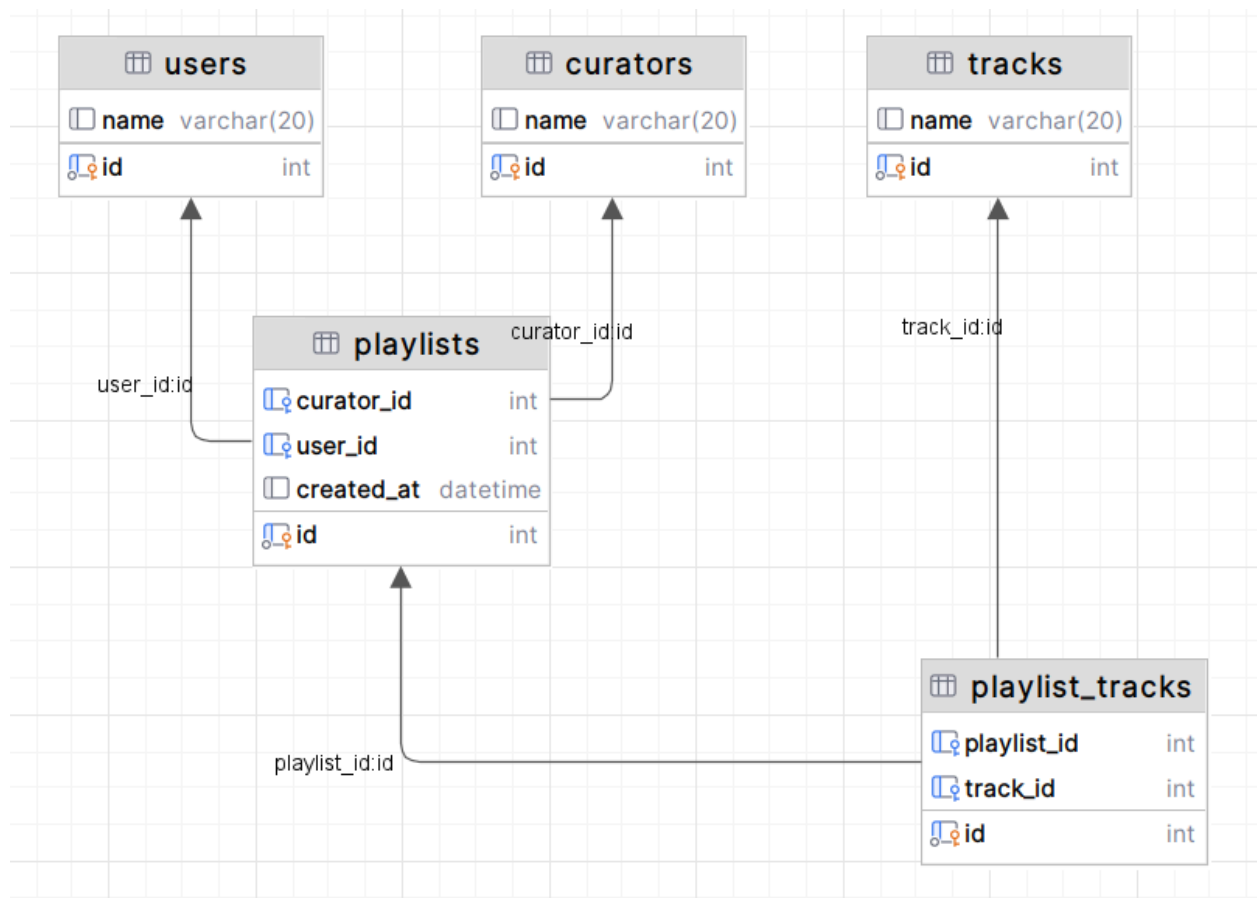


Task 4

4. You are designing a database for a music streaming platform to manage users, playlists, tracks, and curators. A playlist contains many tracks, and a track can appear in many playlists. A curator (staff) can manage many playlists, but each playlist is managed by exactly one curator. A user can create many playlists (user-owned), but playlists are still managed by one curator for quality control.

- Draw/describe the ER model with cardinalities.
- List main entities with key attributes.
- Produce a 3NF relational schema (PKs, FKs).

SOLUTION

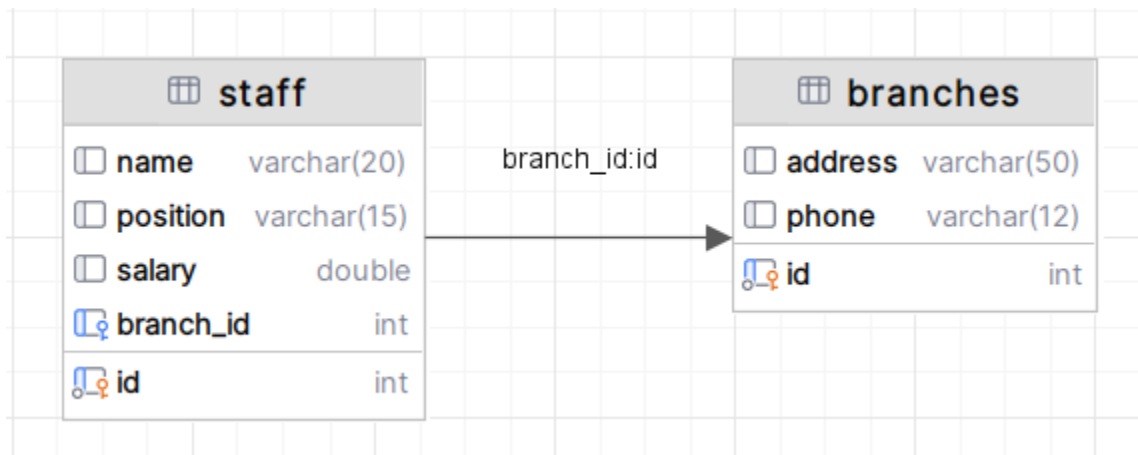


Task 5

5. Normalize the following table up to the 3NF (Third Normal Form). The table contains the following attributes: staffNo, name, position, salary, branchNo, branchAddress, telNo.

staffNo	Name	Position	Salary	branchNo	branchAddress	telNo
S1500	Tom Daniels	Manager	46000	B001	8 Jefferson Way, Portland, OR 97201	503-555-3618
S0003	Sally Adams	Assistant	30000	B001	8 Jefferson Way, Portland, OR 97201	503-555-3618
S0010	Mary Martinez	Manager	50000	B002	City Center Plaza, Seattle, WA 98122	206-555-6756
S0415	Robert Chin	Supervisor	32000	B002	City Center Plaza, Seattle, WA 98122	206-555-6756

SOLUTION

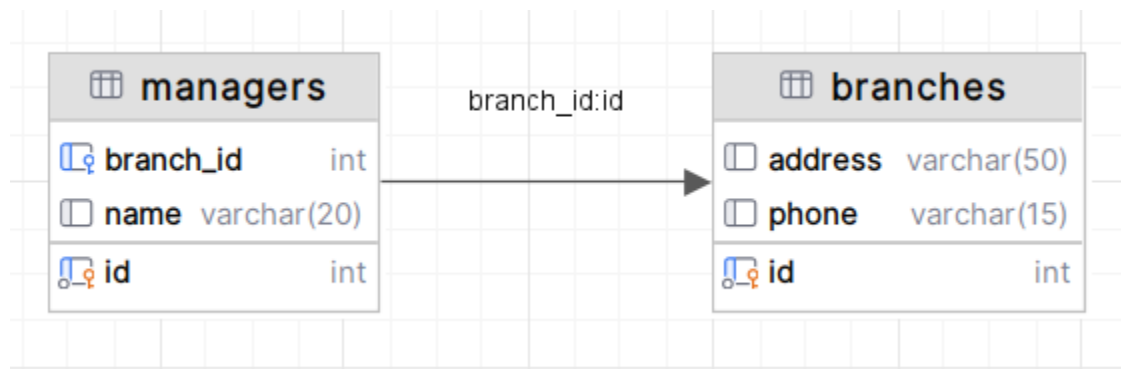


Task 6

6. Normalize the following table up to the 3NF (Third Normal Form). The table contains the following attributes: branchNo, branchAddress, telNo, mgrStaffNo, name

branchNo	branchAddress	telNo	mgrStaffNo	name
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618	S1500	Tom Daniels
B002	City Center Plaza, Seattle, WA 98122	206-555-6756	S0010	Mary Martinez
B003	14-8th Avenue, New York, NY 10012	212-371-3000	S0145	Art Peters
B004	16-14th Avenue, Seattle, WA 98128	206-555-3131	S2250	Sally Stern

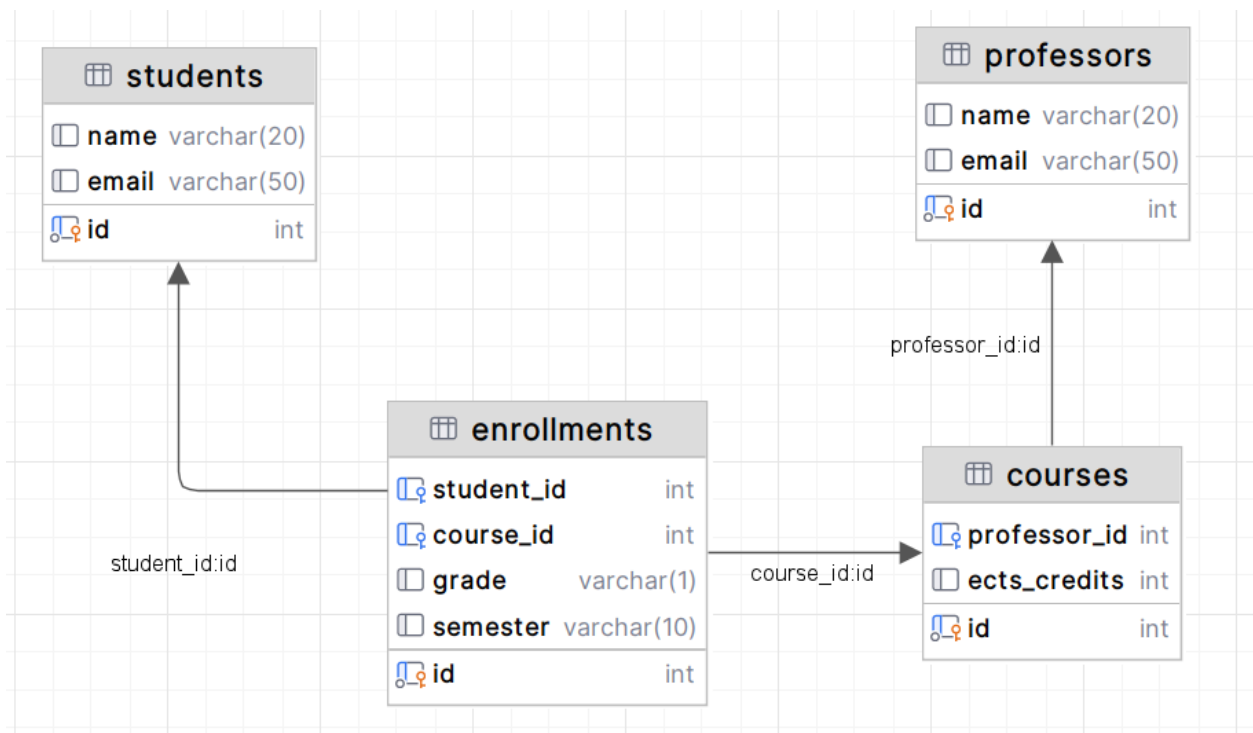
SOLUTION



Task 7

7. You are tasked with developing a database system for a university's course management system to efficiently handle its diverse academic programs, students, and faculty members. Each student can enroll in multiple courses, and each course can have multiple students enrolled. Faculty members are responsible for teaching multiple courses, but each course is taught by a single faculty member. The system should facilitate course registration, track academic performance, and manage faculty assignments, ensuring smooth and effective academic operations within the university.

SOLUTION:



Task 8

8. You are developing a sophisticated database system for a large retail chain, which involves managing inventory, suppliers, and store locations. In this system, each product in the inventory can be supplied by multiple suppliers, and each supplier can provide multiple products. This creates a many-to-many relationship between products and suppliers. Additionally, each store location carries multiple products, but each product is only available at specific store locations. This establishes a many-to-many relationship between products and store locations. Furthermore, each store location is managed by a store manager, but a manager can oversee multiple store locations. However, each store location is assigned to a single manager. This creates a one-to-many relationship between managers and store locations.

SOLUTION:

