Sample Scenarios for ERD

Draw ERD and transform the ERD into relation schema for the following questions:

Q1: A university needs to manage information about students and their course enrollments. The system requires tracking both course information (course ID, title, and credit hours) and student information. The student details are: Student ID, Name (first name, middle name, last name), Present address (including house number, street, thana, district, and postal code), permanent address (including house number, street, thana, district, and postal code), multiple email addresses and multiple mobile numbers, date of birth, Total Credits, CGPA and calculated age. You have to record semester, year, marks, grade_point, letter_grade for courses taken by students. A student can improve or repeat the courses taken by him. There are many projects undertaken by students under the guidance of teachers. Each teacher can supervise multiple projects, and each project can involve multiple students. However, a specific project-student pairing must be supervised by only one teacher. To track this information, we need to record the project ID, title, location, and budget for each project. For each teacher or supervisor, we need their ID, name, street address, thana, district, and salary

Q.2: The library information system is described below:
A book can be issued to only one borrower but a borrower can borrow multiple number of books. Borrower is a person who is authorized to borrow books from the library for a specific number of days. Each borrower must have a membership id, name, contact number and address.
When a book is issued some information such as issue date, book id, borrower id, length of period for issue and return due date are needed to enter in to the database. At the same the borrowed book should be labeled as issued and will be cleared after return by the borrower. After return of the book, it can be issued to another borrower. So a book is borrowed by multiple borrowers in different times.

Q. 3: All people working in an organization are called employees identified by employee id. All employees must have name, address, mobile and email. An employee must be one of the following: technical or non-technical. Technical employees have the trade and year of experience. Non-technical employees have highest degree and year of experience.

Q. 4: A person is described by id, name as first name, middle name, last name, multiple qualifications and trainings, present address (street no, street name, city) and permanent address (street no, street name, city).

Q. 5: There are many teachers in the university. Teacher has Id, name, salary. Among the teachers, Head of the department is appointed for a certain period of time (start date and end date). A teacher may be appointed Head many times. In different times, different teachers are appointed as Head.

Q6: A club can have many players and a player can join only one club for a period of time with a start date and end date. After completion of period, the player can join another club. A club has id, name and date of establishment. A Player has id, p-name and date of birth. A club has many teams with team-id, date of formation, closing date. A team has many players and a player can play many teams. Each team has only one manager but a manager can manage many teams. A manager has an id, name and salary.

Q.7: A teacher can teach many courses and a course is taught by exactly one teacher. A teacher has id, name and degree. A course has course-id, title and credit.

Q. 8: All people working in an organization are called employees identified by employee id. All employees must have name, address, mobile and email. An employee must be one of the following: technical or non-technical. Technical employees have the trade and year of experience. Non-technical employees have highest degree and year of experience.

Q. 9: A person is described by id, name as first name, middle name, last name, multiple qualifications and trainings, present address (street no, street name, city) and permanent address (street no, street name, city).

Q.10: There are many football teams participated in world cup 2018. A team has id and country. A team plays with another team in a particular date and a title of the play e.g., round 1, semi-final etc.

Q11:

There are many departments (attributes: dept-code, name, budget) in a university. Each department has many teachers (attributes: tid, name, designation) and students (attributes: sid, name, cgpa). A teacher or a student must belong to only one department. There are many courses (attributes: course-id, title, credit-hour) offered in a department but a course must belong to only one department. The participation of teachers, students and courses to the corresponding relationships are all total. A teacher must be either full-time (attributes: salary, scale) or part-time (attributes: course-honorarium, institute). A teacher may be the adviser to many students but a student must have only one adviser. Only full-time teacher can be adviser to the students. A course can have one or more than one pre-requisite courses with a reason. A teacher can teach multiple courses and a course can be taught by multiple teachers. A department can have only

one building (attributes: id, name, location) and a building can have at most one department. There will be no null entries in the database.

a. Design ERD to store all information as above.
b. Transform the ERD into relation schema

ERD: Lecture 3

1. Many to Many relationship with descriptive attributes:

A teacher can teach many courses and a course can be taught by many teachers. A course has course_id, title and credit_hour and a teacher has T_id, name, designation salary. You have to record the semester and year of teaching of these courses by the teachers.

Draw the ERD and transform the ERD into relation schema.

2. One to many or Many to one relationship

A mother can have many children and a child must have only one mother. A mother has NID, name, street, city. A child have birth registration number (BRN), date of birth, height and weight.

Draw the ERD and transform the ERD into relation schema.

3. One to one relationship

An apartment can be owned by exactly one person and a person can own maximum one apartment. There are many persons having no apartment. A person has NID, name, date of birth, street, city and income. An apartment has app_id, size, app_name, floor_number, location and price.

Draw the ERD and transform the ERD into relation schema.

4. Weak Entity set

A course has course_id, title and credit_hour. A section has sec_id, semester and year. A course has many sections and a section has exactly one course. The section id cannot identify the section uniquely a section because the same section id is used for different courses. The section id, semester and year jointly cannot identify a section uniquely. So section has no primary key.

Draw the ERD and transform the ERD into relation schema.

5. Total and partial participation

An instructor can advise many students but a student must have exactly one adviser. An instructor has id, name, dept_name and salary. A student has id, name, street, city, CGPA and tot_credit.

Draw ERD showing total and partial participation and transform the ERD into relation schema.

6. ERD with complex constraints

A student can enroll a maximum of 45 courses and a minimum of 3 courses. A course can be enrolled by minimum 15 students and a maximum of 35 students. A student has id, name, street, city, CGPA and tot_credit. A course has course_id, title and credit_hour.

Draw the ERD and transform the ERD into relation schema.

7. Non-Binary (Ternary Relationship)

There are many projects developed by many students and supervised by instructors. An instructor can supervise many projects developed by many students but any project-student pair must be supervised by only one instructor. A project has P_id, location and budget. A student has id, name, street, city, CGPA and tot_credit. A superviser has s_id, name, date of birth and salary.

Draw the ERD and transform the ERD into relation schema.

8. Converting Non-Binary (Ternary Relationship) into binary relationship

ERD: Lecture 4

9. Non-Binary (Ternary Relationship)

There are many projects developed by many students and supervised by instructors. An instructor can supervise many projects developed by many students but any project-student pair must be supervised by only one instructor. A project has P_id, location and budget. A student has id, name, street, city, CGPA and tot_credit. A superviser has s_id, name, date of birth and salary.

Draw the ERD and transform the ERD into relation schema.

10. Cardinality Constraints on Ternary Relationship

See the slides for details

11. Converting Non-Binary (Ternary Relationship) into binary relationship

12. Specialization

A person has id, name, present address and permanent address. A person may be employee, business man, farmer, unemployed, senior citizens or others. Employees may be government or private. Each employee must have organization work for, basic salary, educational qualification. A business man must have trade license id, vat registration number. A farmer must have land size, location. An unemployed person must

have previous employment status, qualification and age. A senior citizen shall have a seniority position and honorarium. Others have type and priority.

Draw the ERD and transform the ERD into relation schema.

13. General problem

There are many employees working in many projects. Each project has a manager who is also an employee. An employee has e_id, name, DOB and salary. A project has p_id, p_name and budget. An employee can work for many projects with a start_date and end_date and a project have many employees. Employees are two types: professional and non_professionals. A professional has profession name and membership. A non_professional has year of experience.