3.3 Relational database design

Name: _____ Class: _____ Date: _____ **Total: 15 marks**

KEY WORDS relational database • entity • primary key • foreign key

Objective

Design relational tables using entities, primary keys, and foreign keys.

You must be able to:

- identify entities and their attributes
- choose a primary key
- use a foreign key to model a relationship

1 Key knowledge and worked examples

Model the relationship

A course system needs `students`, `courses`, and `enrolments` tables. Each table represents an **entity**. `students.id` is a **primary key** because it uniquely identifies one student.

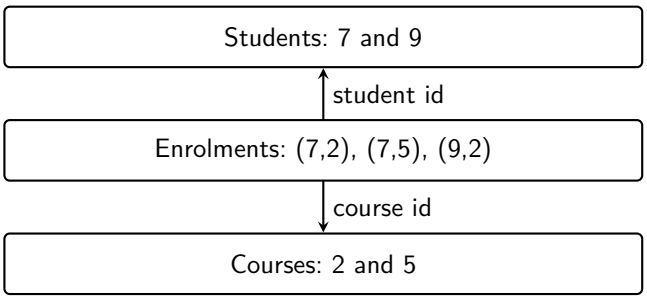
`enrolments.student_id` is a **foreign key** pointing to `students.id`. It records which student is enrolled without copying their name into every enrolment row.

Key knowledge: Model a many-to-many relationship

A junction table records one relationship per row. Two foreign keys refer to existing entities; a suitable unique pair can prevent duplicate relationships.

Worked example: Model a many-to-many relationship

Student 7 enrols in courses 2 and 5, while student 9 enrols in course 2. The enrolment rows are `(7,2)`, `(7,5)` and `(9,2)`. Student names stay in the students table and course titles stay in courses. The pair `(student_id, course_id)` can be unique so that the same student is not enrolled twice in the same course. This is a many-to-many relationship.



2 Practice

2.1 Define a primary key. [1]

2.2 State which key points to a row in another table. [1]

2.3 Explain why storing one student's name in every enrolment row can cause problems. [2]

3 Exam-style questions

3.1 A library has books, members, and loans. Explain how a loans table can connect a member to a book. [4]

3.2 Explain why a unique primary key is important when updating or deleting a record. [4]

3.3 A student can join many courses and a course can have many students. Name the extra table, its two reference fields, and one useful uniqueness rule. [3]

Solutions

2.1

- A value that uniquely identifies a row in a table.

2.2

- A foreign key.

2.3

- The same detail is duplicated in many rows.
- A name change may be updated inconsistently.

3.1

- The loans table is an entity recording each loan.
- It has its own primary key.
- It stores a member foreign key and a book foreign key.
- Each foreign key points to the matching primary key in its table.

3.2

- It identifies exactly one record.
- The system updates or deletes the intended row.
- It avoids confusing two records with similar names or values.
- This protects consistency in related tables.

3.3

- an enrolments/junction table; student_id and course_id as foreign keys; make the student-course pair unique to prevent duplicate enrolments.