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DATA 300 (Section B) - Final Exam
Table: ENROLLMENT_RAW
Attributes
(student_id, student_name, student_phone, course_id, course_title, course_fee, instructor_id, instructor_name, instructor_phone, room_id, room_capacity, enrollment_dat
Assumptions
● A student can enroll in many courses.
● A course can have many students.
Tasks (Provide your answer Step-by-Step)

1. List all functional dependencies. (5 marks).
For example, let's say If we can derive columns B, C, D from column A. you can write "A→ B, C, D"

Answer:

1.student_id → student_name, student_phone
2.course_id → course_title, course_fee
3.instructor_id → instructor_name, instructor_phone
4. room_id → room_capacity
5.(student_id, course_id) → enrollment_date

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2. Find all candidate key(s) for ENROLLMENT_RAW. (3 marks)

Answer:

All candidate keys are student_id and course_id. This is because one single student can enroll in many courses, more than one course! Similarly, one single course can be enrolled by multiple students.

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3. Verify whether the table is in 1NF. Provide your reason. (3 marks)

Answer:

The table is in 1NF, First Normal Form, because of two reasons. Firstly, all the attributes inside the table are atomic attributes, which means attributes are not repeated groups. Secondly, every single cell has a single value. For example, student_id > '001', student_name > Mg Mg, address> Yangon.

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4. Decompose into 2NF relations. Show partial dependencies and provide 2NF schema. (5 marks)
For example, if the candidate keys are columns A and B but column C depends only on B, you have to write, B → C
2NF schema
Table 1 (Column names)
Table 2 (Column names)

Answer:

Partial Dependency means that non-key attributes are depending on the part of composite keys.

Partial dependencies are:
student_id→ student_name, student_phone
course_id → course_title, instructor_id, room_id

2NF schema
1.student (student_id, student_name, student_phone)
2.course (course_id, course_title, course_fee, instructor_id, room_id)
3.enrollment (student_id, course_id, enrollment_date)

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5. Further decompose into 3NF. Show transitive dependencies and provide 3NF schema. (5 marks)

Answer:
Transitive dependencies are:
instructor_id → instructor_name, instructor_phone
room_id → room_capacity

3NF schema:
student(student_id, student_name, student_phone)
course(course_id, course_title, course_fee, instructor_id, room_id)
instructor(instructor_id, instructor_name, instructor_phone)
room(room_id, room_capacity)
enrollment(student_id, course_id, enrollment_date)

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6. Show final tables relations schema with primary keys and foreign keys. (2 marks)

Answer:

Final Tables, relations' schema with primary keys and foreign keys are:

student(student_id[PK], student_name, student_phone)
course(course_id[PK], course_title, course_fee, instructor_id[FK], room_id[FK])
instructor(instructor_id[PK], instructor_name, instructor_phone)
room(room_id[PK], room_capacity)
enrollment(student_id[FK], course_id[FK], enrollment_date)

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7. Explain how the final schema avoids update, insert, and delete anomalies. (2 marks)

Answer:

Update anomalies happen when a single data value is stored in multiple places inside a table. Thus, when we update the data value in one place, we also need to update it in other places as well! However, in our table, Update anomalies are avoided because descriptive data like course_id or student_id are stored in only one single place.

Insert anomalies are avoided because the schema uses independent tables for different entities. For example, we can add a new course even if we are not having a student enrollment.

Delete anomalies are avoided through relational links. We can delete an enrollment without removing either course or instructor details.

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Table: ENROLLMENT_RAW

student_id	student_name	student_phone	course_id	course_title	course_fee	instructor_id	instructor_name	instructor_phone	room_id	room_capacity	enrollment_date
S01	Aye	089-111	C10	SQL Basics	3000	I05	Mr. Kaung	098-888	R1	40	2025-09-01
S02	May	082-333	C10	SQL Basics	3000	I05	Mr. Kaung	098-888	R1	40	2025-09-02
S03	Lin	087-444	C10	SQL Basics	3000	I05	Mr. Kaung	098-888	R1	40	2025-09-03
S01	Aye	089-111	C20	Python	3500	I07	Ms. Cathy	095-222	R2	30	2025-09-10
S04	Moe	086-555	C20	Python	3500	I07	Ms. Cathy	095-222	R2	30	2025-09-11
S05	Thura	081-666	C30	Data Analysis	4000	I08	Mr. Win	094-777	R3	25	2025-09-05
S02	May	082-333	C30	Data Analysis	4000	I08	Mr. Win	094-777	R3	25	2025-09-06
S06	Nandar	083-777	C20	Python	3500	I07	Ms. Cathy	095-222	R2	30	2025-09-12
S07	Kyaw	084-888	C40	Web Dev	3200	I09	Mr. Zaw	097-999	R4	35	2025-09-08
S01	Aye	089-111	C40	Web Dev	3200	I09	Mr. Zaw	097-999	R4	35	2025-09-09