Database Exam

Lyon Student Party Scene

Name _____ Student ID _____ Date _____

Duration: 60 minutes | Total: 20 points

Exercise 1 Database modelling

8 points

A student events platform manages recurring party series in Lyon. Each association has a unique AssociationID and a name. Each party series has a unique SeriesID, a title and a music style, and is organised by exactly one association. An association may organise any number of series, including none.

Each series may have any number of editions, including none. An edition belongs to exactly one series and is identified by its EditionNo within that series; the same EditionNo may occur in different series. Store its start and end timestamps. Each edition takes place at exactly one venue. A venue has a unique VenueID, a name and a Lyon district number, and may host any number of editions.

Each student has a unique StudentID, a name and a home district number. A student may register for any number of editions, and an edition may have any number of registered students, including none. Record the amount paid in euros for each registration. A student can register at most once for the same edition; the amount may differ between students and between editions.

A. Draw an ER diagram with attributes, identifiers, relationship cardinalities and participation constraints. Explain your modelling decisions. (4 points)

B. Reduce the ER diagram to a relational schema. Show all primary and foreign keys and state any constraints not captured by those keys. SQL DDL is not required. (3 points)

C. For each resulting relation, state its candidate key(s), relevant functional dependencies and highest normal form among 1NF, 2NF, 3NF and BCNF. Justify your answer (1 point)

Use the following three requests to test your design. You do not need to write SQL/RA here.

1. For a given series and edition number, which students registered, and how much did each pay?
2. Which editions take place at venues in Lyon district 7 during January 2027? Give the series title, edition number and venue name.
3. Which students have never registered for any edition?

Exercise 2 Relational algebra and SQL

5 (2.5+2.5) points | all queries count the same, yes even the harder one!

Use the independent schema below. For every query, write both a relational-algebra expression and an SQL query (0.5 points each). You do not need to compute the results.

All attributes are non-null. IDs are integers, monetary values are numeric, and dates have type DATE. January 2027 means 2027-01-01 inclusive to 2027-02-01 exclusive.

Sample data are illustrative; your queries must work for every valid instance.

Party(PartyID, Title, District, EventDate) as P

PK: PartyID

Student(StudentID, StudentName, HomeDistrict) as S

PK: StudentID

Registration(PartyID, StudentID, PaidEUR) as R

PK: PartyID, StudentID; FK: PartyID → Party.PartyID; StudentID → Student.StudentID

Party

PartyID	Title	District	EventDate
1	Campus Beats	7	2027-01-10
2	River Night	2	2027-01-24
3	Winter Groove	7	2027-02-05
4	Late January	7	2027-01-31

Student

StudentID	StudentName	HomeDistrict
10	Amira	7
20	Hugo	2
30	Lina	3
40	Noah	7

Registration

PartyID	StudentID	PaidEUR
1	10	8
1	20	10
2	20	12
3	30	7
4	10	9

1. Give all party titles.
2. Give the IDs and names of students whose home district is 7.
3. Give the IDs and names of students registered for at least one party in district 7 during January 2027.
4. Give the IDs and titles of parties with at least one registered student whose home district equals the party district.
5. Give the IDs and names of students with no registration for any party during January 2027. Include students who have never registered.
6.

Exercise 3 Theory

7 (2+2+3) points | Two open questions and three multiple-choice questions

Open questions

1. Consider RegistrationDetail(StudentID, StudentName, PartyID, PaidEUR), with StudentID → StudentName. Define a functional dependency and explain what this dependency means. Describe an update anomaly that can occur when a student registers for several parties. (2 points)
2. A ticketing transaction inserts a registration and reduces the number of available tickets. Consider two failures: (a) it fails after insertion but before updating the count; (b) the system crashes after the transaction commits. For each case, name the relevant ACID property and explain the required outcome. (2 points)

Multiple choice

Choose exactly one answer per question. Each correct answer earns 1 point; an incorrect, blank or multiple answer earns 0 points.

D. In Student(StudentID, Email, Name), StudentID and Email are each unique and non-null; names need not be unique. Which set is a candidate key?

E. {StudentID, Name}

F. {Email}

G. {Name}

H. {StudentID, Email}

Answer: _____

I. Which operation changes the relational schema of Student?

J. Inserting a new student

K. Updating a student's name

L. Adding a BirthDate attribute

M. Deleting a student

Answer: _____

N. Student(StudentID, HomeCity) contains (1, Lyon), (2, Lyon) and (3, Paris). Under set semantics, how many tuples does π HomeCity (Student) contain?

O. 2

P. 3

Q. 1

R. 0

Answer: _____