Question 1

The following set of relations contain sample data which represents information about students borrowing textbooks.

LENDING

Student_no	Book_no	Copy_no
S1	B1	3
S1	B2	15
S1	B3	4
S2	B1	17
S2	B3	19
S2	B4	21
S3	B3	57
S3	B4	32
S3	B7	16
S5	B5	1
S5	B6	5
S5	B8	7
S6	B1	6
S6	B3	29
S7	B1	51
S7	B2	3
S7	B3	7
S9	B1	15
S9	B3	14
S9	B4	12

STUDENT

Student_no	Student_name	Student_class
S1	Jones	Science-1
S2	Smith	Science-2
S3	Brown	Maths-1
S4	Green	Maths-1
S5	Black	Maths-2
S6	White	Science-2
S7	Charlton	Science-1
S8	Best	Maths2
S9	Lak	Science-2

BOOK

Book_no	Book_title	Author
B1	Human Biology	Edwards
B2	Plant Biology	Edwards
B3	Engineering	Moore
B4	Maths	Catlan
B5	Advanced Maths	Borrock
B6	Quantum Physics	Vernon
B7	Chemistry	Black
B8	Biochemistry	Davis

Using the Student, Lending and Book relations give the relational algebra query formats for:

(i) Find the names of students who are in the "Maths2" class.

(ii) Find the Book_no and Copy_no of books borrowed by 'Smith' and 'Black'.

(iii) Find the authors of books borrowed by 'Science-1' students.

(iv) Find the books borrowed by student 'Lak'.

(v) Find the students who borrow all books by 'Edwards'.

(vi) Find all available copies of 'Human biology' and 'Plant biology' books.

(vii) Find students who have borrowed Biochemistry' but not 'Plant biology' books.

Question 2

A relational database management system of a car rental service includes the following tables:

RENTAL(rental-number, number-plate-number, rental-date, return-date, rental-period, customer-id)

CAR (number-plate-number, model, engine-displacement, company, seating-capacity)

CUSTOMER (customer-id, name, membership-type)

Formulate Relational Algebra solutions to the following queries:

(a) List information about cars made by HYUNDAI.

(b) List the full details of rentals issued on 15th May 2022.

(c) Find the name and membership-type of agents who have rented a CRETA.

(d) Find details of any car which have been rented by a PREMIUM member.

(e) Find details of any car which has never been rented by a PREMIUM member.

(f) Find the rentals which have a rental-period of more than 7 days.

Question 3

Denormalize the following normalized table.

Person can be both customer and author, one person can have multiple addresses. After a customer takes a book, a record is kept and in one record there could be one or many books. One customer could have one or many records. Author could write one or many books and the publisher could publish one or many books.