A brief SQL-syntax diagram should be included

Please, submit TWO answer papers, one for tasks 1 and 2 and the other for tasks 3 and 4. Please, write the name of the course, your name clearly, your date of birth or your student number, and your signature on both answer papers.

1. (ANSWER PAPER 1)
   In the following schemas X Y indicates that attribute X is a foreign key that refers to relation Y. (X,Z) Y indicates that both X and Z constitute the foreign key.
   a) Explain briefly (one statement) the concept domain in the relational model.
   b) Consider the relations A(B,C,D,E) and F(G,H,I). Foreign keys are not shown. Is it possible that attribute G is a foreign key that refers to relation A? Justify your answer briefly.
   c) Consider the relations J(K->P,L,M,N) and P(Q,R,S). Relation J has 10000 tuples and relation P has 200 tuples. The relations are joined on condition J.K=P.Q. How many tuples are there in the result?
   d) Consider relation J above. How many tuples are at most in the result of projection πK(J)
   e) Consider the relation R(A,B,C,D) and S(A,B,H). Is the natural join of R and S possible and if it is what columns are included in the result?
   f) Consider the relations S above. Which of the following projections has more rows πA(S) or πA,H(S)? Justify your answer briefly.
   g) Tuples with K value 111 are deleted from relation J (case c, above). What should be done to relation P?

(14p)

2. (ANSWER PAPER 1)
   Consider the following pawn shop database:
   customer(personalID, name, address, city, phone)
   officer(officerID, name, jobtitle, phone, email)
   loan(loanNo, amount, customer->customer, dateAdmitted, whoAdmitted$>officer)
   pawn(receiptNo, type, description, age, value, loanNo$loan, evaluator$officer)
   instalment(loanNo$loan, instalmentNo, dueDate, amount)

   a) List in decreasing order by value the receipt number, age, description, and value for cameras (type is camera) provided as pawns and evaluated since the beginning of August this year.
   b) Find out how many customers have received loans during this year and what is the total amount of these loans.
   c) Remove from the database data about customers that have no loans.
   d) Prepare a list of customers that have more than 7 loans. Include in your report customer data and the amount of customer’s loans and their total amount. (12p).

Turn the paper for tasks 3 and 4 and give their answer on a separate paper.
3. (ANSWER PAPER 2) The following conceptual schema describes the information in the management of master’s theses.

Which of the following claims do not conflict with the schema above?

- a) a student may attend many groups of the same course during one term.
- b) group number is an internal sequence number within a course
- c) simultaneously registered entries are possible
- d) an entry is identified by the time of registration and the name of the task type.

f) Construct a relational database schema based on the above diagram. Use the notation of task 2 to represent the schema. (4+6p)

4. (ANSWER PAPER 2) A fishing club arranges about 10 fishing contests in a year. They have designed the following database table to register contest results:

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catch (contest_ID, contest_location, contest_date, fisherman_ID, fisherman_name, fish_species, fisherman_yearofbirth, fishermans_catch_weight, fishermans_number_of_fishes_in_catch, fishermans_ranking_in_contest)
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a) What would the functional dependency \( \text{contest\_ID} \rightarrow \text{fish\_species} \) mean in practice?

b) Which columns of this table depend functionally on the column \( \text{contest\_ID} \)?

c) How is the rule 'a fisherman may attend only one contest on the same day' expressed as a functional dependency? (9p)

*Turn for tasks 1 and 2 and give their answer on a separate paper.*