Chapter 2

Relational query languages:

Multiple Choice Questions:

1. We have _____ and _____ to qeury instances of relational database.
    a. Relational algebra, Expression algebra
    b. Relational algebra, Relational calculus
    c. Domain algebra, Tuple calculus
    d. Relational calculus, Expression algebra
    Answer: b. Relational algebra, Relational calculus
2. Set intersection is _____ operation
    a. Fundamental
    b. Basic
    c. Additional or derived
    d. None of the above
    Answer: c. Additional or derived
3. _____ commands are used to add, retrive, update data in database.
    a. TCL
    b. DDL
    c. DQL
    d. DML
    Answer: d. DML
4. DELETE command is used to _____ from table.
    a. Delete records from table
    b. Drop the table
    c. Delete the table
    d. Delete and drop the records of table
    Answer: a. Delete records from table
5. Relational calculus tells _____.
    a. How to do
    b. What to do
    c. How and what to do
    d. All of the above
    Answer: b. What to do
6. In tuple relational calculus filtering variable uses:
    a. Attributes of relation
    b. The whole relation
    c. Tuples of the relation

d. It depends on condition given
Answer: c. Tuples of the relation

7. In domain relational calculus filtering variable uses:
   a. Tuples of the relation
   b. Domain of attributes
   c. Attributes and tuples of relation
   d. (a) and (b)
   Answer: b. Domain of attributes
8. SQL depends upon:
   a. Relational algebra and relational calculus
   b. Tuple and domain
   c. Domain algebra, Tuple calculus
   d. Relational calculus, Expression algebra
   e. **Answer:** a. Relational algebra and relational calculus
9. TRUNCATE command is:
   a. DQL
   b. DML
   c. TCL
   d. DDL
   Answer: d. DDL
10. MySQL is:
    a. Commercial DBMS
    b. Open source DBMS
    c. Both (a) and (b)
    d. None of the above
    Answer: b. Open source DBMS
11. Sybase and Oracle are:
    a. Commercial DBMS
    b. Open source DBMS
    c. Both (a) and (b)
    d. None of the above
    Answer: a. Commercial DBMS

Fill in the blanks:

1. Relational algebra is _____ language.
   Answer: Procedural
2. In Relational algebra we have _____ fundamental operations.
   Answer: Six
3. Cartesian product is _____ operation.
   Answer: Binary
4. Rho, ρ, is symbol used for _____
   Answer: Rename operation
5. Relational calculus is _____ language.
   Answer: non-procedural
6. Relational calculus has _____ sub-types.
   Answer: two
7. Domain relational calculus _____ operators.
   Answer: logical connective
8. Relational algebra is basis for _____.
   Answer: SQL
9. DBMS with SQL3 support are known as _____.
   Answer: OR-DBMS
10. INSERT is _____ command.
    Answer: DML

Short answer questions:

1. What is relational algebra?
   Keywords: procedural, relations, instances, language
2. What is Relational calculus?
   Keywords: non-procedural, instances, tuple, domain
3. What are the fundamental relational operations?
   Keywords: select, rename, project, cartesian, set-difference, union
4. Exaplin tuple and domain relational calculus.
   Keywords: connectives, condition, filtering variable
5. What is SQL3? Answer in brief.
   Keywords: OR-DBMS, Encapsulation, Inheritance, Triggers

6. Exaplain DDL and give its examples.
   Keywords: define structure, Create, alter, drop
7. Exaplain DML and give its examples.
   Keywords: data, update, delete, insert
8. How domain and tuple relational calculus different.
   Keywords: filtering variables, connectives
9. Exaplin unary relational operations.
   Keywords: select, project, rename
10. Exaplain binary relational operations.
    Keywords: set difference, cartesian product, union

Long answer questions:

1. Differentiate between DML and DDL
   Keywords:
2. Exaplain SQL3 and its features.
   Keywords: Exaplain DDL and give its examples.
3. Explain both the types of relational calculus and give the difference between the two.
   Keywords: domain, tuple, operators, connectives.
4. Exaplain relational algebra and give exaplain its fundamental types with examples.
   Keywords: rename, select, project, cartesian, set difference, union
5. Exaplin SQL and its types of commands.
   Keywords: DDL, DML, DQL, TCL, DCL

Relational Database Design:

Multiple Choice Questions:

1. Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F = {CH -> G, A -> BC, B -> CFH, E -> A, F -> EG} is a set of functional dependencies (FDs) so that F+ is exactly the set of FDs that hold for R. How many candidate keys does the relation R have?

   (a) 3

   (b) 4

   (c) 5

   (d) 6

   Answer: (b) 4

2. Consider the following relational schema:

   Suppliers(sid:integer, sname:string, city:string, street:string)

   Parts(pid:integer, pname:string, color:string)

   Catalog(sid:integer, pid:integer, cost:real)

   Assume that, in the suppliers relation above, each supplier and each street within a city has a unique name, and (sname, city) forms a candidate key. No other functional dependencies are implied other than those implied by primary and candidate keys. Which one of the following is TRUE about the above schema?

   (a) The scheme is in BCNF

   (b) The scheme is in 3NF but not in BCNF.

   (c) The scheme is in 2NF but not in 3NF.

   (d) The scheme is not in 2NF.

   Answer: (a) The scheme is in BCNF

3. Consider the relation scheme R = {E, F, G, H, I, J, K, L, M, M} and the set of functional dependencies {{E, F} -> {G}, {F} -> {I, J}, {E, H} -> {K, L}, K -> {M}, L -> {N} on R. What is the key for R?

   (a) { E,F }

   (b) { E,F,H }

(c) { E,F,H,K,L }

(d) {E}

Answer: (b) { E,F,H }

4. The maximum number of superkeys for the relation schema R(E,F,G,H) with E as the key is

(a) 5

(b) 6

(c) 7

(d) 8

Answer: (d) 8

5. The relation scheme Student Performance (name, courseNo, rollNo, grade) has the following functional dependencies:

name, courseNo → grade

rollNo, courseNo → grade

name → rollNo

rollNo → name

The highest normal form of this relation scheme is:

(a) 2 NF

(b) 3 NF

(c) BCNF

(d) 1 NF

Answer: (b) 3 NF

6. Relation R is decomposed using a set of functional dependencies, F and relation S is decomposed using another set of functional dependencies G. One decomposition is definitely BCNF, the other is definitely 3NF, but it is not known which is which. To make a guaranteed identification, which one of the following tests should be used on the decompositions? (Assume that the closures of F and G are available).

(a) Dependency Preservation.

(b) Lossless-join

(c) BCNF definition

(d) 3NF definition

Answer: (c) BCNF definition

7. Which of the following FD can't be implied from FD set: {A->B, A->BC, C->D} ?

(a) A->C

(b) B->D

(c) BC -> D

(d) All of the above

Answer: (b) B->D

8. Consider a schema R(A, B, C, D) and following functional dependencies.

A → B, B → C, C → D,D → B. then decomposition of R into R1 (A, B), R2(B, C) and R3(B, D) is:

(a) Dependency Preserving and lossless join.

(b) Lossless join but not dependency Preserving.

(c) Dependency Preserving but not lossless join.

(d) Not Dependency Preserving and not lossless join.

Answer: (a) Dependency Preserving and lossless join.

9. Which of the following statements is TRUE? D_1 : The decomposition of the schema R(A, B, C) into R_1(A, B) and R_2 (A, C) is always lossless. D_2 : The decomposition of the schema R(A, B, C, D, E) having AD → B, C → DE, B → AE and AE → C, into R_1 (A, B, D) and R_2 (A, C, D, E) is lossless.

(a) Both D_1 and D_2

(b) Neither D_1 nor D_2

(c) Only D_1

(d) Only D_2

Answer: (d) only D_2

10. The set of attributes X will be fully functionally dependent on the set of attributes Y if the following conditions are satisfied.

(a) X is functionally dependent on Y.

(b) X is not functionally dependent on any subset of Y.

(c) Both (a) and (b)

(d) None of these.

Answer: (c) Both (a) and (b)

Fill in the blanks.

1. Normalization is used to eliminate _____.

Answer: Redundancy

2. X→Y is _____ FD if Y is a subset of X.

Answer: Trivial

3. Attributes of relations which are part of candidate key are known as _____.

Answer: Prime Attribute.

4. _____ normal form is considered adequate for normal relational database design.

Answer: 3 NF

5. Minimal Super key is known as _____

Answer: Candidate key.

Short Questions:

1. What is functional dependency? Explain trivial and non trivial functional dependency with example.

Keywords: FD, subset, trivial, Non-trivial

2. Given R= (A, B, C, G, H, I). The following set F of functional dependencies holds A -> B, A -> C, CG -> H, CG -> I, B -> H Compute AG+ . Is AG a candidate key?

Keywords: Candidate key, Attribute closure

Long Questions:

1. What is meant by normalization? Write its need. List and discuss database anomaly during database design.

   Keywords: Redundancy, normal forms, Insert anomaly, update anomaly, delete anomaly

2. Consider schema EMPLOYEE(E-ID,E-NAME,E-CITY,E-STATE) and

   FD = {E-ID->E-NAME, E-ID->E-CITY, E-ID->E-STATE, E-CITY->E-STATE}

   (1) Find attribute closure for: $(E\text{-}ID)^+$ **(2)** Find$(E\text{-}Name)^+$

   Keywords: Attribute Closure

Query Processing and Query Optimization

Multiple Choice Questions:

1. **In external sorting, the number of runs that can be merged in every pass are called**
    a. Degree of sorting
    b. Degree of runs
    c. Degree of passing
    d. **Degree of merging**
2. **The results of each intermediate operation are created and then are used for evaluation of the next-level operations. This is called**
    a. **Materialized evaluation**
    b. Expression evaluation
    c. Tree evaluation
    d. Tree materialization
3. **Pipelines can be executed in**
    a. 4
    b. 3
    c. **2**
    d. 5
4. **In a _____ the system makes repeated requests for tuples from the operation at the top of the pipeline.**
    a. **Demand-driven pipeline**
    b. Producer-driven pipeline
    c. Demand pipeline
    d. All of the mentioned
5. **In a _____ operations do not wait for requests to produce tuples, but instead generate the tuples eagerly.**
    a. Demand-driven pipeline
    b. **Producer-driven pipeline**
    c. Demand pipeline
    d. All of the mentioned
6. **Tuples are generated _____ in producer-driven pipelining, they are generated _____ on demand, in demand-driven pipelining.**
    a. Lazily, Eagerly
    b. **Eagerly, Lazily**
    c. Slowly, Eagerly

d. Eagerly, Slowly

7. **In a _____ the system scans each file block and tests all records to see whether they satisfy the selection condition.**
   a. Index Search
   b. **Linear search**
   c. File scan
   d. Access paths

Long Questions:

1. **Explain different search algorithm for selection operation.**
   Keywords: Linear Search and Binary Search
2. **Explain evaluation expression process in query optimization.**
   Keywords: Materialization and Pipelining
3. **Explain steps in Query Processing.**
   Keywords: Parser and translator, Optimizer, Evaluation
4. **Explain transformation of relational expression to equivalent relational expression.**
   Keywords: Equivalence Rules