

Q1) For each of the following multiple choice questions, choose one correct answer:

1. SQL stands for:

- a. Software Query Language.
- b. System Query Language.
- c. **Structured Query Language.**
- d. Standard Query Language.

2. In the relational model the term relation is used to refer to a _____.

- a. **Table.**
- b. Row.
- c. Column.
- d. Database.

3. The _____ operation allows the combining of two relations by merging PAIRS of tuples, one from each relation, into a single tuple.

- a. Select.
- b. **Join.**
- c. Union.
- d. Intersection.

4. Which one of the following is a set of one or more attributes taken collectively to uniquely identify a record?

- a. Candidate key.
- b. Primary key.
- c. **Super key.**
- d. Foreign key.

5. Tables in second normal form (2NF):

- a. **Eliminate all hidden dependencies.**
- b. Eliminate the possibility of insertion anomalies.
- c. Have a composite key.
- d. Have all non-key fields depend on the whole primary key.

6. Multivalued attribute *phone_number* (*M*) of entity *instructor* (*E*) is represented by a schema EM. For example:

Inst_phone = (*ID*, *phone_number*)

Which of the following is correct?

- a. Each value of the multivalued attribute maps to a separate tuple of the relation on schema EM.
- b. Each value of the multivalued attribute maps to a same tuple of the relation on schema EM.
- c. There is no need of writing multivalued attributes in relational designs.
- d. Multivalued attributes can be ignored and instead can be combined into composite attributes.

7. Tables are in second normal form (2NF):

- a. All non-key attributes are fully functional dependent on the primary key.
- b. Have a composite key.
- c. There is no transitive functional dependency.
- d. None of the above.

8. _____ is an object that exists and is distinguishable from other object.

- a. Attributes.
- b. Domain.
- c. Relation.
- d. Entity.

9. Database is a collection of:

- a. Data.
- b. Schema.
- c. Data Relationships.
- d. All of the above.

10. The term _____ refers to a column of a table.

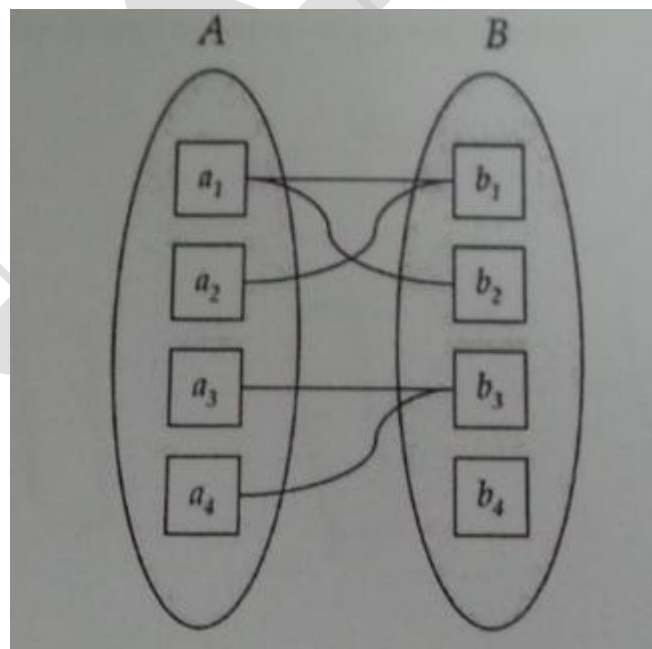
- a. Instance.
- b. Attribute.
- c. Tuple.
- d. Relation.

Q2) For each of the following statements, answer with True or False.

1.	In a relational table, each column represents an attribute and each column has a distinctive name.	T
2.	All non-binary relationships are naturally binary and thus can be represented using binary relationships.	F
3.	A relational schema (R) is in first Normal form, if the domains of all attributes of (R) are atomic.	T
4.	Although several candidate keys may exist in a Table, no candidate key can be selected to be the primary key.	F
5.	Physical level of the database design describes the data stored in database, and the relationships among the data.	F
6.	The intersection operation allows the combining of two relations by merging pairs of tuples, one from each relation, into a single tuple.	F

Q3) Fill- in the following blanks with the most appropriate words.

1. U symbol is used to represent union operation of relations.
2. In generalization, the property by which an entity can belong to more than one lower-level entity set is called overlapping.
3. An entity set that does not have a primary key is referred to as a weak entity set.
4. In relation schemas, composite attributes are flattened out by creating a separate attributes for each component attribute.
5. The following diagram represents a many –to- many relationship.



Q4) Answer the following questions briefly.

a. List FOUR disadvantages of using File Systems to store data.

b. What are the components of relational database?

c. For a binary relationship set, explain how primary key is selected in case of each of the following:

- i. One-to-one relationship.
- ii. Many-to-many relationship
- iii. Many-to-one or one-to-many relationship.

Q5) Consider the below tables, then give an expression in the relational algebra to express each of the following queries.

STUDENT			
STU_ID	STU_NAME	STU_MAJUR	DEPT_NAME
45565	Srinivasan	Geophysics	Physics
22222	Mozart	Accounting	Business
12121	Gold	Finance	Business
32343	Enistein	Nuclear physics	Physics
58583	Califieri	Comp. Sci.	Comp. & Info. Sci.

REGESTERIED	
STU_ID	COURSE_ID
45565	PHY-101
45565	CS-101
12121	FIN-201
58583	CS-101
32343	CS-101

COURSE			
COURSE_ID	TITLE	CREDIT	DEPT_NAME
PHY-101	Physical Principle	4	Physics
FIN-201	Investment Bank	2	Business
CS-101	Intro. to Computer Science	3	Comp. & Info. Sci.
CS-190	Game Design	3	Comp. & Info. Sci.
CS-347	Database System Concept	4	Comp. & Info. Sci.

1. List the IDs of courses for which no student is registered.

$$\prod COURSE_ID(COURSE) - \prod COURSE_ID(REGESTERD)$$

2. Names of students who are belonged to Business department.

$$\prod STU_NAME(\sigma DEPT_NAME = 'BUSINESS'(STUDENT))$$

3. IDs and names of students who are registered for both 'Intro. to computer science' and 'Game Design'.

$$\prod STU_ID, STU_NAME(STUDENT, REGESTERED(\sigma TITLE 'Intro. to computer science', 'Game Design'))$$

6) Consider the following set S of functional dependencies on relation schema R(A,B,C,D,E,F), where:

$A \rightarrow BCD$

$BC \rightarrow DE$

$B \rightarrow D$

$D \rightarrow A$

Prove that AF is a superkey in R.

You MUST show all the stages your work and use Armstrong's Axioms to explain every step

AF \rightarrow ABCDEF

$A \rightarrow ABCD$

$ABCD \rightarrow ABCDE$

$AF \rightarrow ABCDEF$

Q7) Use an E-R Diagram to design a database for a football match. The database must store the match, team and player details along with the match results as the following:

Entity *match* has the attributes: match_id, date and stadium... where match_id is the primary key.

Entity *team* has the attributes: name and season_stats... where name is the superkey.

Entity *player* has the attributes: player_id, name, age and season_score... where player_id is the primary key.

played is a relationship between *match* and *player* that includes the following attributes: matc_id, player_id and score.

match_team is a relationship between *match* and *team* that has the following attributes: match_id, name, score and result.

player_taem is a relationship between *player* and *team* that has the following attributes: player_id and name.