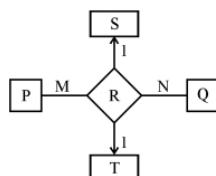


Q.1)

Consider the following E-R diagram

Subject: DBMS

Max Marks: 1



If different symbols in relations given below stand for different values. For example, given attribute value t1 is not equal to t2, then which of the following could not be the relationship set for the above E-R diagram?

A

P	Q	S	T
p1	q1	s1	t1
p2	q2	s2	t2

B

P	Q	S	T
p1	q1	s1	t1
p1	q2	s1	t1

C

P	Q	S	T
p1	q1	s1	t1
p1	q1	s1	t2

Correct Option

Solution: (c)

For option (i), (ii) and (iv): P is satisfying the many-to-one relationship with both S and T and many-to-many relationship with Q. Similarly, other entities also satisfy their relationship. So this is the valid relationship set

For option (iii): S should have one-to-one relationship with T but here single value of S, s1 is mapped for two different values of T, t1 and t2. Therefore, option (iii) could not be the relationship set.

D

P	Q	S	T
p1	q1	s1	t1
p2	q2	s1	t1

Q.2)

Consider the following two relations X(a, b) and Y(b, c):

Relation X:

a	b
1	1
2	1
2	2
3	4
3	5

Relation Y:

b	c
1	2
2	2
3	4
4	3
5	3

What is the number of tuples returned by the following 2 queries?

Query 1:

$$\prod_{a,c}(X \bowtie Y)$$

Query 2:

SELECT a, c FROM X, Y WHERE X.b = Y.b;

- A 5, 5
- B 4, 5
- C 5, 3
- D 3, 5

Correct Option

Solution: (D)

The Query 1: will output the distinct tuples (project operation discards the duplicates). Therefore, the output of it will be:

a	c
1	2
2	2
3	3

Query 2 will return all the possible tuples whose X.b = Y.b. Select operation does not discard the duplicates. Hence it will output:

a	c
1	2
2	2
2	2
3	3
3	3

Hence the number of tuples in the result set after executing query1 and query2 are 3, 5 respectively.

Q.3)

Subject: DBMS

Max Marks: 1



Which of the following statements are true about the relational algebra and tuple relational calculus for the given query.

$$\{t | t \in S \wedge (t[X] = 50 \wedge t[Y] = 90)\}$$

- I. The above tuple relational calculus query is equivalent to $\sigma_{(X=50)}(S) \cap \sigma_{(Y=90)}(S)$
- II. The above tuple relational calculus query is equivalent to $\sigma_{(X=50)}(S) - \sigma_{(Y=90)}(S)$

- A Only I
- B Only II
- C Both I and II
- D Neither I nor II

Correct Option

Solution: (A)

In the given tuple relational query, the tuple t has two attributes X and Y with t.X and t.Y as 50 and 90 respectively. So, the tuples having both X and Y is nothing but all the tuples having X = 50 and Y = 90. Hence, only statement 1 is correct.

Q.4)

Subject: DBMS

Max Marks: 1



The relationship between 2 entity A and B is 1:1 and the relation is optional at the end. Only 50% of B entities are related to A. On considering mapping these entity types into relations, which of the following statement is best suited?

- A A and B should be separate and foreign key should be in B relation
- B A and B should be separate and foreign key should be in A relation

Correct Option

Solution: (B)

Given relation as 1:1 and 50% of B entities are related to A. This means A is related to those 50% of B only in 1:1 cardinality. So, on bringing an attribute from B to A will not lead to any wastage of memory which will be there if the foreign key is present in relation B. If relation B has the foreign key then there will be 50% of wastage by making NULL values for tuples for which A is not related to B.

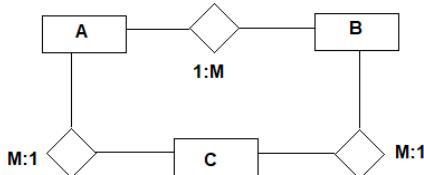
C A and B should be separate and foreign key should be in A and B both relation

D None of these

Q.5)

Max Marks: 1

Which of the following is true for the given E-R diagram



- I. Relation A may have primary key of the relation C as primary key
- II. On conversion to the relational model we need minimum of 3 relations for this ER diagram.

A Only I

B Only II

Correct Option

Solution: (B)

Solution: (ii)

Minimum 3 relations are required for A, B, C respectively. Since, the relationship between them is one-to-many or many-to-one so, we don't need any extra relation and we can put the relationship attribute on the many side.

Relation A may have primary key of the relation C as primary key. This statement is wrong because primary key of relation C may become the foreign key of the relation A but not the primary key of relation A.

C Both I and II

D Neither I nor II

Q.6)

Subject: DBMS

Max Marks: 1

On considering two relation R1 (ABC) and R2 (CDE), where C is the primary key of R1 and E is the primary key of R2. If R1 consists of 500 tuples while R2 consists of 1000 tuples then the maximum number of tuples present in the operation R1 NATURAL JOIN R2 will be _____

Correct Answer

Solution: (1000)

C is the common attribute in between relation R1 and R2 and is a primary key of R1, therefore, all 500 values of C in R1 are unique. Since R1 contains 500 C values and R2 contains 1000 values of C then these 500 unique values could be associated with 1000 values of C in R2. Hence, the maximum number of tuples in the result set of R NATURAL JOIN S will be 1000.

Q.7)

Max Marks: 1

Consider an entity relationship model with two strong entities E1 and E2 and one weak entity E3. E1 has self referential and one-to-many relationship with itself. While E2 is having an identification relationship with E3. Attribute X and Y are the primary keys of entities E1 and E2 respectively. The relationship between E1 and E2 is having cardinality of 1:1 and total participation with E1. What is the minimum number of relations required for the above designed entity relationship diagram?

A 1

B 2

Correct Option

Solution: (B)

Solution: (ii)

Only 2 relations are required for the above E-R diagram.

(i) Since, the self referential relationship is one-to-many with E1 therefore, there is no need to have a separate relation for this relationship. Hence, it could be merged with E1. Therefore, # of relations = 1

(ii) Relationship between E1 and E2 is one-to-one with total participation on E1 side, therefore we can merge E1 and E2 to form a single relation. Therefore, # of relations = 1

(iii) Entity E3 is a weak entity connected with E2, therefore it will have separate relation for itself. Therefore, # of relations = 1

Hence, the total number of relations required are = 2.

C 3

D 4

Q.8)

Which of the following statements are correct about the transformation of a relation algebraic expression from LHS to RHS.

Subject: DBMS

Max Marks: 1

I.

$$\sigma_A(\prod_B(R)) \rightarrow \prod_B(\sigma_A(R))$$

II.

$$\prod_B(\sigma_A(R)) \rightarrow \sigma_A(\prod_B(R))$$

Only I

Only II

Both I and II

Neither I nor II

Correct Option

Solution: (D)

If the selection condition is on A than we cannot replace it by RHS as there will not be any attribute A due to projection of B only.

Q.9)

Descriptive attributes are used to

Subject: DBMS

Max Marks: 1

Record information about participating entities

Record information about aggregation

Record information about class hierarchy

Record information about relationship

Correct Option

Solution: (D)

Like entities, a relationship too can have attributes. These attributes are called descriptive attributes. Descriptive attributes are used to record information about the relationship. It gives additional information about the relationship.

Q.10)

Given the two relation CUSTOMER (cust_id, cust_name, city) and PRODUCT (pid, cid, price):

Subject: DBMS

Max Marks: 1

Relation CUSTOMER:

Cust_id	Cust_name	City
1	Sudhir	Lucknow
2	Raj	Bhopal
3	Raman	Bhopal
4	Raman	Mathura

Relation PRODUCT:

Pid	Cid	Price
P1	1	1000
P1	2	2000
P2	3	3000
P3	4	4000

If the below relational algebra query is ran over the above instances of CUSTOMER and PRODUCT relation, than what will be the number of tuples in the result set?

$$\prod_{pid} (PRODUCT) / \prod_{cust,d} (\sigma_{city="Kolkata"}(CUSTOMER))$$

1

2

3

Correct Option

Solution: (C)

Since, there is no customer who lives in the city Kolkata. Therefore the number of tuples

Since, there is no customer who lives in the city Kolkata. Therefore, the number of tuples returned by below fragment of query is zero.

$$\prod_{cust,d} (\sigma_{city='Kolkata'}(CUSTOMER))$$

Hence, the result set will contain the tuples which are returned by executing:

$$\prod_{pid} (PRODUCT)$$

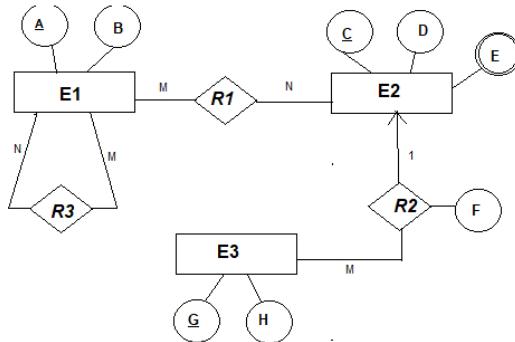
Since, it will return the distinct Pid's and there are 3 distinct Pid's in the given instance. Hence, the result set will contain 3 tuples.

D

4

Q.11)

Consider the following relation:



What is the minimum number of relations required for building relational model of the above E-R model?

A

4

B

5

C

6

Correct Option

Solution: (c)

Total 6 relations are required based on the following analysis:

(i) For entity E1 and E2, We need 4 relations in minimum. Because the relation between E1 and E2 is many-to-many, therefore R1 will have a separate relation as well as E2 consist of a multivalued attribute. Thus, it will form a separate relation. Hence, we have relation for E1, R1, E2 and E. Therefore, # of relation = 4.

(ii) For entity E2 and E3, E3 will have separate relation because of the one-to-many relation (R2) between them. Therefore, # of relations = 5.

(iii) For self referential + many-to-many + both side partial relation R3 will result in one separate relation. Therefore, # of relations = 6.

Hence, the total number of relations required for the above E-R diagram are 6.

D

None of the above

Q.12)

Consider an Entity-relation (ER) model in which entity sets A, B, and C, where A is the weak entity. They are connected by m:1 relationship R₁₂ and R₁₃ in between A-B and A-C respectively. (in both the relationship many is always on the A side). A has two-singled attributes a1 and a2 of which a1 is the key. B has 2 singled attribute b1 and b2 of which b1 is the primary key. C also has two singled attributes c1 and c2 of which c1 is the primary key. Which of the following is correct attribute set for one of the minimized relational database management systems for the above E-R model?

A

C (a1, c1, c2)

B

B (b1, a1, b2)

C

A (a1, b1, a2)

D

A (a1, b1, c1, a2)

Correct Option

Solution: (d)

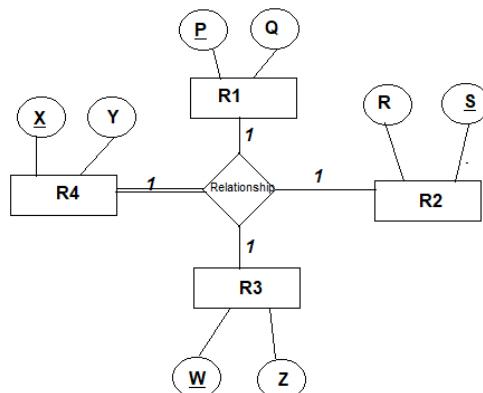
Here, entity A is a weak entity and is having many-to-one relationship with both B and C so, there is no requirement to have separate relation for both the relations and hence, they can be merged with A. Now we know that if no attribute is mentioned in the relationship also, it compulsorily contains the keys of participating entities. So in the relationship R₁₂ we contain both a1 and c1 as its attributes so on merging with A, the attribute c1 has to be included in the relation that will be formed by A, R₁₂, R₁₃.

So, the attribute set of the merged RDBMS relation will be: {a1, b1, c1, a2} and the keys will be

: {a1, b1, c1}. Hence, correct option in (iv).

Q.13)

For the given E-R diagram, minimum number of relations required are _____



Subject: DBMS

Max Marks: 2

Correct Answer

Solution: (3)

Two relations are required for R1 and R3 respectively. While R4 and R2 could be combined into one relation because of the total participation of R4 with the relationship. Therefore, they could be combined and hence, minimum number of relations required for this E-R diagram is 3.

Q.14)

Consider the following relation schema and a query that uses additional operators of relational algebra.

R (A, B, C);

S (D, A, E);

T (A, B, C, D, E);

U (C, D, E)

$$((R \bowtie S) \cap T) \div U$$

What can be said about the result set if we write this query using only the 6 basic operators of relational algebra? Select the correct option.

A

Result set of the basic-operator-query will be larger than the result set of a given query.

B

Result set will have attributes A and B only

Correct Option

Solution: (B)

Additional operators do not add any power over basic relational algebra, thus the query can be written using basic operators, and however the result set will be exactly the same since it would be the exact same query. It is evident from the definition of the involved operators that all relevant schemas are compatible. Schema of natural join will be (A, B, C, D, E) since the join will happen on A, and division with (C, D, E) will result in schema (A, B).

C

Some of the operations in query be performed due to incompatible relation schemas.

D

Query cannot be written using only basic operators.

Q.15)

Consider two $n \times 1$ vectors u and v , stored as table $U(index, val)$ and $V(index, val)$ with the same schema. A row (i, u_i) of table U specifies the i^{th} element of vector u has value u_i (similarly for v , respectively). Only the non-zero entries of the vectors are stored in the corresponding tables. For example, if the vector u equals $(0, 1, 3, 0, 2, 0)$, then it is represented in table U as:

Index	Val
2	1
3	3
5	2

Which of the following is the correct expression to compute the sum $u + v$ in the form of relation (for the same indices having value) of the two vectors u and v .

I. SELECT U.index, SUM(U.val + V.val) as element_tot
FROM U, V
WHERE U.index = V.index;

II. $\prod_{U.index, (U.val+V.val) \in element_tot} (\sigma_{U.index=B.index}(U \times V))$

Subject: DBMS

Max Marks: 2

A Only I

B Only II

Correct Option

Solution: (B)

The sum of vector $u + v$ corresponds to the sum of values at the same index in both relations U and V. Suppose vector u is $(0, 1, 3, 0, 2, 0)$ and vector v is $(0, 0, 3, 0, 1, 0)$. Corresponding to this relation U and V will be as follows:

Relation U:

Index	Val
2	1
3	3
5	2

Relation V:

Index	Val
3	3
5	1

The Sum of U and V will be:

Index	Val
2	1
5	3
3	6

The query given at I will return the $\text{SUM}(U.index + V.index)$ while we need only $(U.index + V.index)$. Therefore, this query is not equivalent to the given requirement. While the output of II is the same as what we need. Hence II is the correct option.

C Both I and II

D None of the above

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