

# Database Management Systems

1. ER and Relational Model	2003 upto-2022	6 -
2. FD and Normalization	2 -	-
3. Relational Algebra and Calculus	3 -	-
4. Structured Query Language	1 -	-
5. Transaction and concurrency	4 -	-
6. Recovery System	-	-
7. Indexing	5 -	-
Total	-	-

8 marks

CSE	IT
16	2
29	7
28	5
31	6
24	4
03	0
21	4
151	28

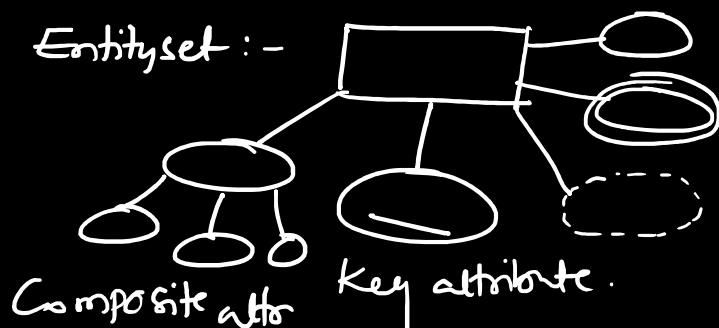
most important

Images:  
9700123473  
Questions

# E-R model

theory -  
msq's

Entity set :-



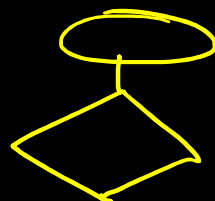
Simple attribute / Single valued.

multivalued attribute.

Derived attribute.

notation / True/False

## Relationship



← Descriptive attributes.

⇒ exactly one.

Key constraint (at most one) →  
Total participation: = (at least one)

Cardinality Ratio's :

1:1  
1:M  
m:1  
m:N

> Each professor teaches one course and a course may taught by many prof's.  
What Cardinality b/w Professor and course.

Class Hierarchy :



Aggregation



Q. Which of the following statements are true.

[MSQ]

- a. Only entity sets can have attributes associated with them. *False*
- b. An attribute of an entity can be both simple as well as single-valued. *True*
- c. Same attribute name should not be used in more than one relation *False*
- d. A key of a relation may have more than one attribute. *True*

$R_1$   
A B

$R_2$   
B C

Suppose that we have a relation schema  $R(A, B, C)$  representing a relationship between two entity sets with keys  $A$  and  $B$ , respectively and suppose that  $R$  has the FD:  $\underline{A} \rightarrow B$  then the relationship in E-R model possible is \_\_\_\_\_.

(A) One to many

~~(B) One to one~~

(C) Many to one

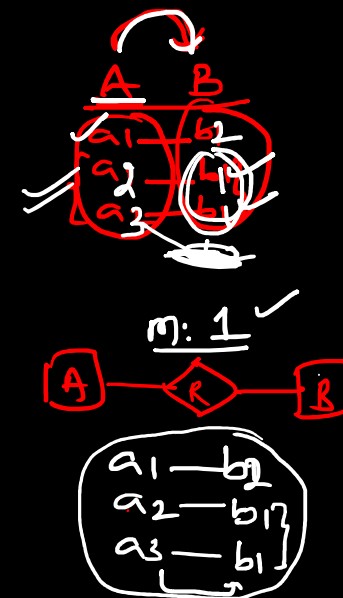
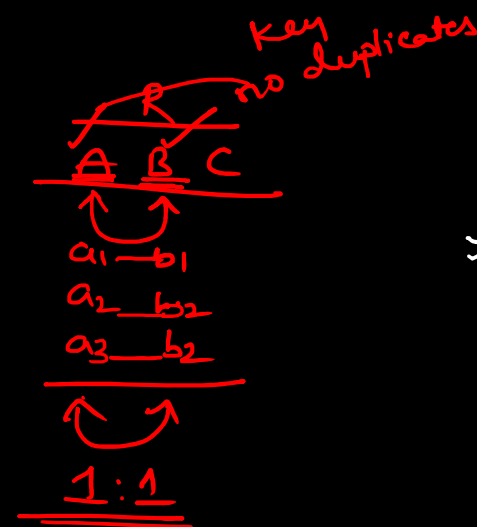
(D) Many to many

Q1:-  $A$  is key  
 $B$  is key  


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 $A \rightarrow B$   
 Cardinality 1:1

Q2  $A$  is key }  
 $A \rightarrow B$  }  
 Cardinality: m:1



What is the correct notation for the above E-R diagram?

[MSQ]

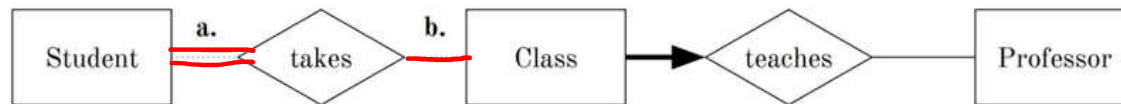


- ☒ (A) Partial participation of E2 in R
- ☒ (B) Total participation of E2 in R
- ☒ (C) Total participation of E1 in R
- ☒ (D) Key constraint from E1 to R.

Question Number. 5

Complete the following ER diagram to enforce that every student must be enrolled in at least one class and that classes can have any number of students.

0 or many  
partial  
no key



- ☒ A. (a) is a Bold Line without an arrow, (b) is a Bold Line without an arrow.
- ☒ B. (a) is a Bold Line with an arrow, (b) is a Bold Line without an arrow.
- ☒ C. (a) is a Bold Line without an arrow, (b) is a thin Line without an arrow.
- ☒ D. (a) is a thin Line without an arrow, (b) is a bold Line without an arrow.

## Relational model

Theory : Relation ✓  
Schema ✓  
Instance ✓

Integrity constraint ✓

Primary key  
Unique  
not null

Foreign key ✓ allow duplicates and null

Check ✓ FK must be there in PK.

✓ violates — on delete parent  
                                insertion into child

✓ FK	{ on delete	{ cascade ✓
	{ on update	{ set null ✓
		{ set default ✓
	<u>parent</u>	<u>child</u>

Primary key — one of ck

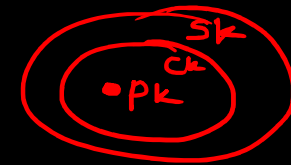
Candidate key : minimal sk.

Super key  
                } unique

no subset is a unique identifier

if (A,B) is unique

then A alone is not unique  
and B alone is not unique.





4. Consider the following relation R(XYZ) with X as the primary key and Z as the foreign key referencing X with on delete cascade. Suppose tuple  $(X_2, Y_2, X_1)$  is deleted, as a result what will be the number of tuples in R after deletion?

X	Y	Z
$X_1$	$Y_1$	$X_7$
$X_3$	$Y_1$	$X_2$
$X_5$	$Y_4$	$X_3$
$X_2$	$Y_2$	$X_1$
$X_9$	$Y_5$	$X_3$
$X_7$	$Y_3$	$X_8$
$X_4$	$Y_2$	$X_2$

5. Consider the following table with two attributes A and B, where A is primary key, and B is foreign key referencing A

A	B
1	4
5	9
3	1
7	6
6	3
9	8
4	2
8	2

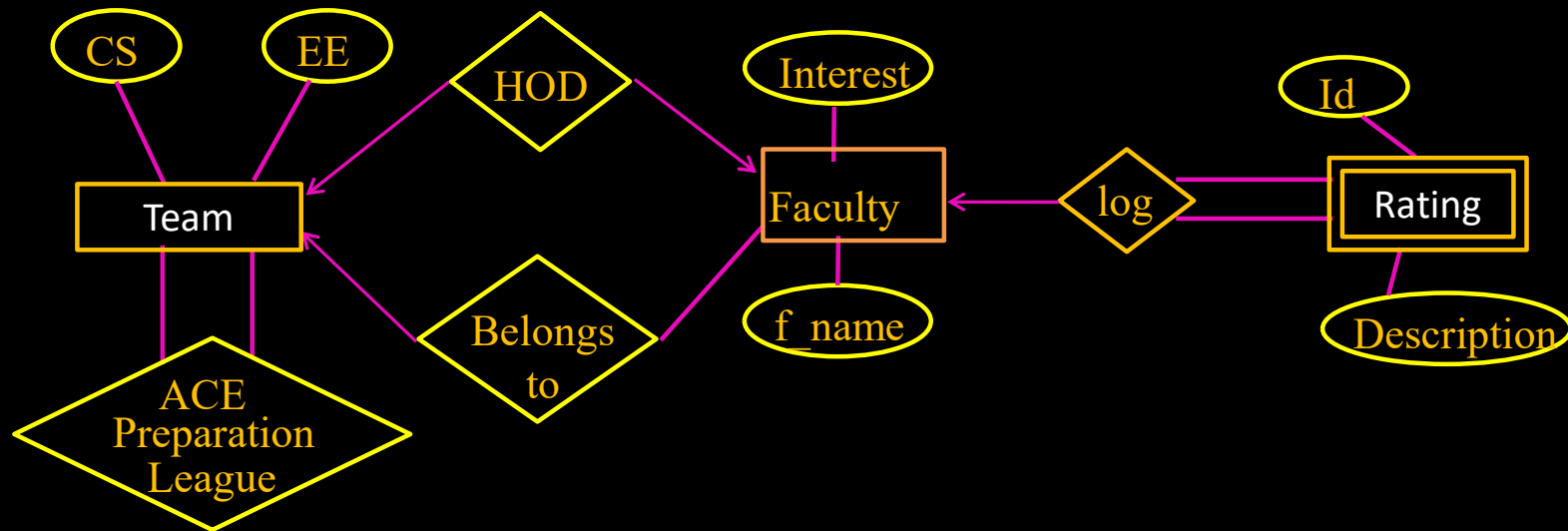
Which of the following statements is/are FALSE?

- (I) If B is the foreign key referencing A with on delete cascade, then on deletion of tuple  $\langle 1, 4 \rangle$  three more tuples will get deleted.
- (II) If B is foreign key referencing A with on delete set NULL, then no more tuples will get deleted if any particular tuple is deleted.
- (III) On deletion of tuple  $\langle 9, 8 \rangle$  and using cascade delete option, tuple  $\langle 5, 9 \rangle$  will also get deleted.
- (IV) By using on delete cascade option the maximum number tuples get deleted on deletion of tuple  $\langle 7, 6 \rangle$

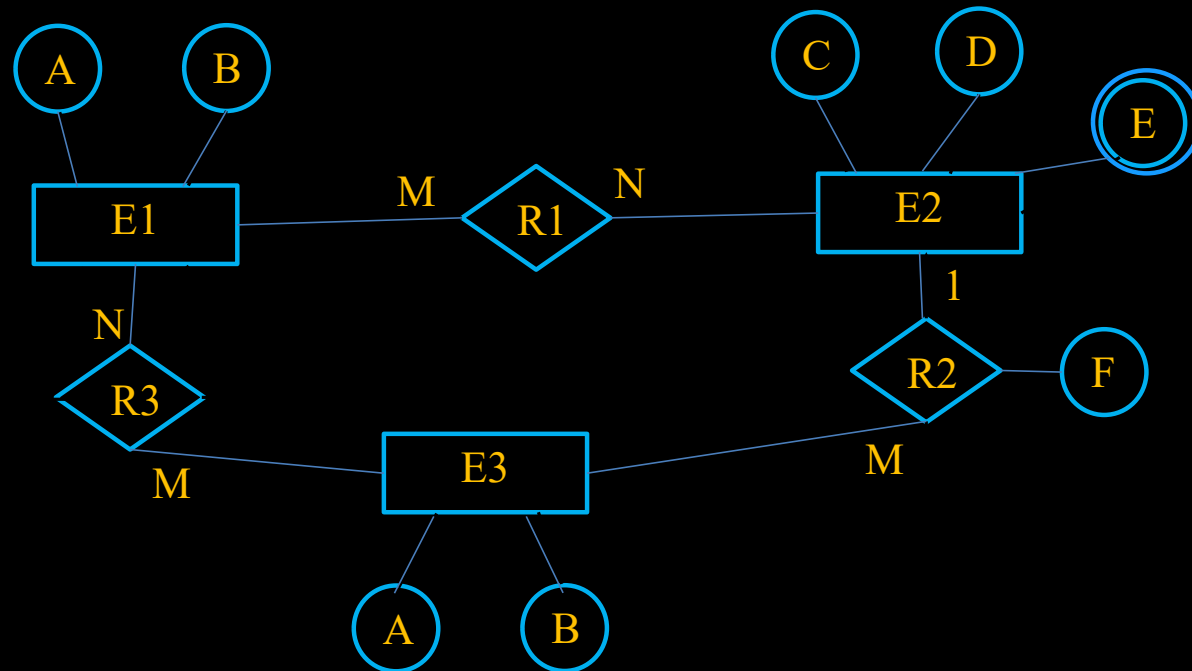
- a. Only IV
- b. I, III and IV
- c. II and IV
- d. I and III

## E-R to Relational model

Q. Consider the below ER Diagram and find the minimum number of tables required for a database to be in 2NF is \_\_\_\_\_



Q. Consider the following relation and find the minimum number of tables in Relational model.



## Functional Dependencies

Q. Consider the following instances of the relation R(ABCDE)

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1	2	3	4	5
1	4	3	4	5
1	2	4	4	1

Which of the following functions dependencies (FD's) hold on R?

I.  $AB \rightarrow C$

II.  $B \rightarrow D$

III.  $DE \rightarrow A$

(A) I only

(B) II only

(C) I and III only

(D) II and III only

Q. Consider the relation  $R(A, B, C, D, E, F, G)$  and the set of following functional dependencies.

$$A \rightarrow E$$

$$\{B, C\} \rightarrow \{G, D\}$$

$$D \rightarrow F$$

Which of the following statement(s) is/are true?

(a)  $\{A, C\} \rightarrow F$

(b)  $\{A, B, C\} \rightarrow \{E, F\}$

(c)  $\{A, B, D\} \rightarrow C$

(d) None



Given  $F = \{A \rightarrow B, B \rightarrow C, C \rightarrow D\}$ , which of the following represents  $F^+$ ?

- a.  $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, BD \rightarrow AC\}$
- b.  $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow ABC, A \rightarrow BCD\}$
- c.  $\{A \rightarrow C, B \rightarrow D, A \rightarrow D, D \rightarrow A\}$
- d.  $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, A \rightarrow BC, BC \rightarrow D\}$

Question Number. 32

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Suppose we have a relation  $R(A, B, C, D, E, F)$  with functional dependencies(FDs):

$$A \rightarrow B$$

$$BCD \rightarrow E$$

$$E \rightarrow F$$

Suppose there are at most 2 different values for each of attributes  $A$ ,  $C$ , and  $D$ . What is the maximum number of different values for attribute  $F$ ?

KEY's

Q. A relation  $R(ABCDEFG)$  with the set of FD's  $\{A \rightarrow BC, AB \rightarrow DE, D \rightarrow EF, F \rightarrow A\}$ . The number of candidate keys for  $R$  is \_\_\_\_\_.

Q. Consider the following relation R(ABCDE)  
with the following FD's  $\{ A \rightarrow BC, CD \rightarrow E, \$ \rightarrow D \}$ .

Unfortunately, we don't know what is \$.

which of the following attribute in place of \$ makes 'A' as candidate key?

- (A) A                      (B) B                      (C) C                      (D) D

- Consider the relation  $R(ABC)$  and functional dependencies  $FD: \{AB \rightarrow C, C \rightarrow B\}$ , then number of prime attributes in  $R$  is \_\_\_\_\_.

## Properties of decomposition

Q. Relation  $R(ABCDE)$  with Id set  $F = \{A \rightarrow BC, C \rightarrow DE, D \rightarrow E\}$  and the decomposition is  $\{R_1(ABCD), R_2(DE)\}$

a. Loss less

b. Lossy

c. Dependency Pressury

d. Not depending presence



## Normal Forms

Q. Consider the following relational schema:

mobile (mobileid, model, cost, batterylife)

mobileid is the candidate key and following are the functional dependencies:

mobileid  $\rightarrow$  model, cost

model  $\rightarrow$  batterylife

Which type of dependency exists in the above relation?

(A) Partial dependency

(B) Full functional dependency

(C) Transitive dependency

(D) Relative dependency

Q. Consider the following relational schemas:

teacher(teacherid, designation, salary)

allocation (teacherid, subject, classroom)

Following are the functional dependencies:

teacherid  $\rightarrow$  designation

designation  $\rightarrow$  salary

teacherid  $\rightarrow$  salary

teacherid, subject  $\rightarrow$  classroom

Which of the following option is TRUE for the relations given above?

(A) Teacher is in 2NF and allocation is in 1NF

(B) Teacher is in 2NF and allocation is in 3NF

(C) Teacher is in 1NF and allocation is in 2NF

(D) Teacher is in 3NF and allocation is in 3NF

Given the following two statements:

**S1:** Every table with two single-valued attributes is in 1NF, 2NF, 3NF and BCNF.

**S2:**  $AB \rightarrow C$ ,  $D \rightarrow E$ ,  $E \rightarrow C$  is a minimal cover for the set of functional dependencies  
 $AB \rightarrow C$ ,  $D \rightarrow E$ ,  $AB \rightarrow E$ ,  $E \rightarrow C$

Which one of the following is **CORRECT**?

- (A) S1 is TRUE and S2 is FALSE
- (B) Both S1 and S2 are TRUE
- (C) S1 is FALSE and S2 is TRUE
- (D) Both S1 and S2 are FALSE

Consider the following two relations:

$R_1 (ABCDE) FD_1 = \{AB \rightarrow CDE, AC \rightarrow BDE, B \rightarrow C, C \rightarrow B, C \rightarrow D, B \rightarrow E\}$

$R_2 (ABCDEF) FD_2 = \{A \rightarrow B, C \rightarrow D, AC \rightarrow E, D \rightarrow F\}$

The highest normal form of relations  $R_1$  and  $R_2$  respectively are \_\_\_\_\_

(a) 1NF, 2NF

(b) 2NF, 2NF

(c) 1NF, 1NF

(d) 2NF, 1NF

The following FDs hold on R:

$\text{part\_no} \rightarrow \text{part\_description}$

$\text{supplier\_id} \rightarrow \text{supplier\_address}$

$\{\text{part\_no}, \text{supplier\_id}\} \rightarrow \text{part\_price}$

find out which of the following statement is TRUE about R:

- a. R is in 1NF only
- b. R is in 2NF but not in 3NF
- c. R is in 3NF but not in BCNF
- d. R is in BCNF

Consider a relation  $R(ABCDE)$  with the following sets of functional dependencies:  $\{B \rightarrow C, D \rightarrow E\}$ .

Determine the normal form of  $R$  and BCNF decomposition of  $R$  respectively.

(a) 3NF,  $\{(BC), (DE)\}$

(b) 1NF,  $\{(BC), (DE)\}$

(c) 2NF,  $\{(BC), (DE), (ABD)\}$

(d) 1NF,  $\{(BC), (DE), (ABD)\}$