RELATIONAL DATABASE MANAGEMENT SYSTEM

- A relational database management system (RDBMS) is a database engine/system based on the relational model specified by Edgar F. Codd--the father of modern relational database design--in 1970.
- Most modern commercial and open-source database applications are relational in nature. The most important relational database features include an ability to use tables for data storage while maintaining and enforcing certain data relationships.

Student

NAME	ID	CITY	COUNTRY	HOBBY
NISHA	1c	AGRA	INDIA	PLAYING
NIKITA	2	DELHI	INDIA	DANCING
AJAY	3	AGRA	INDIA	CHESS
ARPIT	4	PATNA	INDIA	READING

- **Tuple** - Each row of a Relation/Table is called Tuple.
- **Arity/Degree** - No. of columns/attributes of a Relation. E.g. - Arity is 5 in Table Student above.
- **Cardinality** - No of rows/tuples/record of a Relational instance. E.g. - Cardinality is 4 in table Student.
- **Domain (set of permissible value in particular column)** D is a set of atomic values. By **atomic** we mean that each value in the domain is indivisible as far as the formal relational model is concerned.
- A common method of specifying a domain is to specify a data type from which the data values forming the domain are drawn.
  - **E.g.** Names: The set of character strings that represent names of persons.

Properties of Relational tables

- Each row is unique
- Each column has a unique name
- The sequence of rows is insignificant
- The sequence of columns is insignificant.
- Values are atomic
- Column values are of the same kind
- No two tables can have the same name in a relational schema.
- For all relations, the domains of all attribute should be unique. It means elements of all attribute in particular domain is indivisible (cannot be divided). And all attributes should have same property of a domain.

Goals for relational database

- Avoiding redundancies which resulting update, insertion and deletion anomalies by decomposing schemes as necessary.
- Ensure that all decompositions are lossless-join.
- Try all decompositions are dependency preserving.

Update Anomalies- Anomalies that cause redundant work to be done during insertion into and Modification of a relation and that may cause accidental loss of information during a deletion from a relation.

Roll no	name	Age	Br_code	Br_name	Br_hod_name
1	A	19	101	Cs	Abc
2	B	18	101	Cs	Abc
3	C	20	101	Cs	Abc
4	D	20	102	Ec	Pqr

Insertion anomalies: An independent piece of information cannot be recorded into a relation unless an irrelevant information must be inserted together at the same time.

Modification anomalies: The update of a piece of information must occur at multiple locations.

Deletion Anomalies: The deletion of a piece of information unintentionally removes other information.

Roll no	name	Age	Br_code
1	A	19	101
2	B	18	101
3	C	20	101
4	D	20	102

Br_code	Br_name	Br_hod_name
101	Cs	Abc
102	Ec	Pqr

Purpose of Normalization

- Normalization may be simply defined as refinement process. Which includes creating tables and establishing relationships between those tables according to rules designed both to protect data and make the database more flexible by eliminating Redundancy
- Without normalization data base system may be inaccurate, slow and inefficient and they might not produce the data we expect.

FUNCTIONAL DEPENDENCY

- A formal tool for analysis of relational schemas.
- In a Relation R, if 'X' ⊑ R AND Y ⊑ R, then attribute or a Set of attribute 'X' Functionally derives an attribute or set of attributes 'Y',
  - iff each 'X' value is associated with precisely one 'Y' value.
  - For all pairs of tuples t_1 and t_2 in R such that
    - If $T_1[X] = T_2[X]$
    - Then, $T_1[Y] = T_2[Y]$
  - X- Determinant (Determines Y value).
  - Y- Dependent (Dependent on X).
  - If k --> R, the K is a super key of R

- **Note:** A functional dependency is a property of the relation schema R, not of a particular legal relation state/instance r of R.

- **Trivial Functional dependency** - If Y is a subset of X, then the functional dependency X -> Y will always hold.

Q Consider the relation X(P, Q, R, S, T, U) with the following set of functional dependencies F = {

{P, R} → {S,T},

{P, S, U} → {Q, R}

}

Which of the following is the trivial functional dependency in F+ is closure of F? **(GATE-2016) (2 Marks)**

(a) {P, R} → {S, T}

(b) {P, R} → {R, T}

(c) {P, S} → {S}

(d) {P, S, U} → {Q}

Ans: c

Q Which of the following functional dependencies are satisfied by the instance? **(GATE CS 2000)**

X	Y	Z
1	4	2
1	5	3
2	6	3
3	2	2

(A) XY -> Z and Z -> Y
(B) YZ -> X and Y -> Z
(C) YZ -> X and X -> Z
(D) XZ -> Y and Y -> X
Answer: (B)

Q Consider the following relation instance

A	B	C
1	2	4
3	5	4
3	7	2
1	4	2

Which of the following dependencies are satisfied by the above relation instance?
a) A->B, BC->A **b)** C->B, CA->B **c)** B->C, AB->C **d)** A->C, BC->A

Q Which of the following dependencies are satisfied by the relation instance?

A	B	C
1	1	4
1	2	4
2	1	3
2	2	3
2	4	3

A>B
B>C
B>A
C>B
C>A
A>C

Q Which of the following dependencies are satisfied by the relation instance?

X	Y	Z
1	4	3
1	5	3
4	6	3
3	2	2

XZ>X
XY>Z
Z>Y
Y>Z
XZ>Y

Q Consider the following relation instance, which of the following dependency doesn't hold

A	B	C
1	2	3
4	2	3
5	3	3

A) A > b **B)** BC > A **C)** B > C **D)** AC > B

Q Which of the following dependency doesn't hold good?

A	B	C	D	E
a	2	3	4	5
2	a	3	4	5
a	2	3	6	5
a	2	3	6	6

A) A>BC **B)** DE>C **C)** C>DE **D)** BC>A

Ans c

Q From the following instance of a relation scheme R (A, B, C), we can conclude that **(CS-2002)**

A	B	C
1	1	1
1	1	0
2	3	2
2	3	2

(A) A functionally determines B and B functionally determines C
(B) A functionally determines B and B does not functionally determine C
(C) B does not functionally determine C
(D) A does not functionally determine B and B does not functionally determine C
Answer: (B)

Q From the following instance of the relation schema R (A, B, C) we can conclude that

A	B	C
a1	b1	c1
a2	b1	c1
a3	b3	c3
a3	b3	c4
a5	b5	c5

a) A functionally determines B, B functionally determines C
b) B functionally determines C, C functionally determines A
c) A functionally determines B, but B doesn't functionally determine C

d) None of these

ATTRIBUTES CLOSURE/CLOSURE ON ATTRIBUTE SET/ CLOSURE SET OF ATTRIBUTES

- Attribute closure of an attribute set F, can be defined as set of attributes which can be functionally determined from F.
- DENOTED BY F^+

ARMSTRONG'S AXIOMS

- An **axiom** or **postulate** is a statement that is taken to be true, to serve as a premise or starting point for further reasoning and arguments.
- **Armstrong's axioms** are a set of axioms (or, more precisely, inference rules) used to infer all the functional dependencies on a relational database. They were developed by William W. Armstrong in his 1974 paper.
- The axioms are sound in generating only functional dependencies in the closure of a set of functional dependencies (denoted as F^+) when applied to that set (denoted as F).
- **Why Armstrong axioms refers to the Sound and Complete?**
  - By sound, we mean that given a set of functional dependencies F specified on a relation schema R, any dependency that we can infer from F by using the primary rules of Armstrong axioms holds in every relation state r of R that satisfies the dependencies in F.
  - By complete, we mean that using primary rules of Armstrong axioms repeatedly to infer dependencies until no more dependencies can be inferred results in the complete set of all possible dependencies that can be inferred from F.

Armstrong Axioms -

- **Reflexivity**: If *Y* is a subset of *X*, then $X \to Y$
- **Augmentation**: If $X \to Y$, then $XZ \to YZ$
- **Transitivity**: If $X \to Y$ and $Y \to Z$, then $X \to Z$

From these rules, we can derive these secondary rules-

- **Union**: If $X \to Y$ and $X \to Z$, then $X \to YZ$
- **Decomposition**: If $X \to YZ$, then $X \to Y$ and $X \to Z$
- **Pseudo transitivity**: If $X \to Y$ and $WY \to Z$, then $WX \to Z$
- **Composition**: If $X \to Y$ and $Z \to W$, then $XZ \to YW$

Q Armstrong (1974) proposed systematic approach to derive functional dependencies. Match the following w.r.t. Functional dependencies: **(NET-DEC-2013)**

List – I	List – II

a. Decomposition rule	**i.** If X → Y and Z → W then {X, Z} → {Y, W}
b. Union rule	**ii.** If X → Y and {Y, W} →Z then {X, W} → Z
c. Composition rule	**iii.** If X → Y and X→ Z then X → {Y, Z}
d. Pseudo transitivity rule	**iv.** If X → {Y, Z} then X → Y and X → Z

Codes:

	a	**b**	**c**	**d**
(A)	iii	ii	iv	i
(B)	i	iii	iv	ii
(C)	ii	i	iii	iv
(D)	iv	iii	i	ii

Ans: d

Q Decomposition rules is

a) XZ → YZ, X → Y

b) X → Y, Y → Z | X → YZ

c) X → YZ | X → Y, X → Z

d) X → Y, WY → Z | WX → Z

Ans: c

Q In a Relation R (A, B, C, D), with set of functional dependencies as-

{

A → B

B → C

AB → D

}

A^+ = {A, B, C, D}.

Q Consider the relation X (P, Q, R, S, T, U) with the following set of functional dependencies

F = {

{P, R} → {S, T},

{P, S, U} → {Q, R}

}

Which of the following is the trivial functional dependency in F^+ is closure of F?

a) {P,R} → {S,T}

b) {P,R} → {R,T}

c) {P,S} → {S}

d) {P,S,U} → {Q}

Q R(ABCDEFG)

A>B

BC>DE

AEG>G

$(AC)^+$ =?

Q R(ABCDE)

A>BC

CD>E

B>D

E>A

$(B)^+$ =

Q R(ABCDEF)

AB>C

BC>AD

D>E

CF>B

$(AB)^+$ =

Q R(ABCDEFG)

A>BC

CD>E

E>C

D>AEH

ABH>BD

DH>BC

$(BCD)^+$ =

Q Consider the following functional dependencies over the relation R (ABCDEF)

A → B

C → DE

AC→F

What is the closure of (AC)?

a) ACF **b)** ACFDE **c)** ACEFDB **d)** ACFD

Q Let R = ABCDE is a relational scheme with functional dependency set F = {A → B, B → C, AC → D}.
The attribute closures of A and E are **(NET-DEC-2014)**

(A) ABCD, ϕ **(B)** ABCD, E **(C)** Φ, ϕ **(D)** ABC, E

Ans: b

Q In a Relation R (A, B, C, D)_Given, F= {A->B, B->C, C->D} *To check whether, A->C is valid or not?*

APPLICATION OF ATTRIBUTE CLOSURE

Equivalence of Two FD sets-

- Two FD sets F_1 and F2 are equivalent if
  - $F_1^+ = F_2^+$
  - $F_1 \sqsubseteq F_2$ and $F_2 \sqsubseteq F_1$

Q Consider the following set of fd R(ACDEH)

F:	G:
A>C	A>CD
AC>D	E>AH
E>AD	
E>H	

Q R(VWXYZ)

F:	G:
V>W	V>W
VW>X	V>X
Y>VX	Y>V
Y>Z	Y>Z

Q Consider the following set of fd R(ABCDE)

F:	G:
B>CD	B>CDE
AD>E	A>BC
B>A	AD>E

Q consider the following relation r(PQRS)

F:	G:
P>Q	P>QR
Q>R	R>S
R>S	

Q consider the following relation r(ABCD)

F:	G:
A>B	A> BC

B>C	B>A
C>A	C>A

Q consider the following relation r(VWXYZ)

F:	**G:**
W>X	W>XY
WX>Y	Z>WX
Z>WY	
Z>V	

To find the MINIMAL COVER /CANONICAL COVER/IRREDUCIBLE SET

Minimal cover- It means to eliminate any kind of redundancy from a FD set.

- A canonical cover of a set of functional dependencies F, is a simplified set of functional dependencies that has the same closure as the original set F.
- There may be any following type of redundancy in the set of functional dependencies: -
  - Complete production may be Redundant.
  - One or more than one attributes may be redundant on right hand side of a production.
  - One or more than one attributes may be redundant on Left hand side of a production.

Procedure to find MINIMAL COVER-

- Use decomposition rule wherever applicable so that RHS of a production/FD contains only single attribute.
- For every production find the closure value of LHS of production keeping the production in a set, and next time ignoring the production to be in a set. If both closures set matches, it means the production is redundant.
- Remove extraneous attribute on LHS of a production by finding the closure for every possible subset, if in any case the closure is same it means remaining attributes are redundant.

Q R(ABCD)

A>B

C>B

D>ABC

AC>D

Q R(VWXYZ)

V>W

VW>X

Y>VX

Y>Z

Q Which of the following FD set can be reduced further?

a) A->B **b)** B->C **c)** A->B **d)** None of these

C->B	C->B	C->B
D->AC	A->B	AB ->D
AC->D		

Q Find the minimal cover for the FD set {AC → BD, A→C, B → C, D → C}

a) {A → B, A → C, B → C, A → D}

b) {A →B, A → D, A → C, B →D}

c) {A → B, A → D, A → C, B → C}

d) {A → B, A → D, D →C, B → C}

Q R(WXYZ)

X>W

WZ>XY

Y>WXZ

Q The following functional dependencies hold true for the relational schema {V, W, X, Y, Z}:

GATE (2017 SET 1)

V → W

VW → X

Y → VX

Y → Z

Which of the following is irreducible equivalent for this set of functional dependencies?

(a)	(b)	(c)	(d)
V→W	V→W	V→W	V→W
V→X	W→X	V→X	W→X
Y→V	Y→V	Y→V	Y→V
Y→Z	Y→Z	Y→X	Y→X
		Y→Z	Y→Z

Ans: a

To Find a candidate key of a Relation

- We must have to specify how tuples with in a given relation are distinguish from other tuples, so the value of one or more attributes of a tuple must be such that they can uniquely identify the tuple. So, a key field is a column value in a table that is used to uniquely identify tuple in a relation.
- Various Keys used in database System are as follows-

Super key

- Set of attributes using which we can identify each tuple uniquely, all the remaining attributes is called Super key.
- Let X be a set of attributes in a Relation R, if X^+ determines all attributes of R then X is said to be Super key of R.
- Every table will have a least one super key.
- Biggest Super Key possible in a Relation is a Set comprising all attributes of a Relation.
- A relation of '**n**' attributes with every attribute being a super key, then there are 2^n-1

E.g. For a FD set in a Relation (A, B, C, D)-

{

1. $A \rightarrow B$
2. $B \rightarrow C$
3. $AB \rightarrow D$

}

Q The maximum number of super keys for the relation schema R(E, F, G, H) with E as the key is (Gate-2014) (1 Marks)

a) 5 **b)** 6 **c)** 7 **d)** 8

Ans: d

Q A super key for an entity consists of: **(NET-JUNE-2008)**

(A) one attribute only **(B)** at least two attributes

(C) at most two attributes **(D)** one or more attributes

Ans: d

Candidate key

- A super key whose no proper subset is a super key is called Candidate key, also called as **MINIMAL SUPER KEY.**
- There should be at least one candidate key with **Not Null** constraint.
- Prime attribute- Attributes that are member of candidate Keys are called Prime attributes

Q (NET-JUNE-2019)

In relational database management, which of the following is/are property/properties of candidate key?

P : Uniqueness

Q : Irreducibility

1. P only
2. Q only
3. Both P and Q
4. Neither P nor Q

Primary key

- One of the candidate keys is selected by database administrator as a Primary Key.
- Primary Key attribute are not allowed to have Null values.
- Candidate key which are not chosen as primary key is alternate key.

Q A primary key for an entity is: **(NET-DEC-2007)**

(A) a candidate key **(B)** any attribute

(C) a unique attribute **(D)** a super key

Q Which of the following is NOT a superkey in a relational schema with attributes V, W, X, Y, Z and primary key VY? **(GATE – 2016) (2 Marks)**

(a) VXYZ **(b)** VWXZ **(c)** VWXY **(d)** VWXYZ

Ans: b

Q Which one is correct w.r.t. RDBMS? **(NET-JAN-2017)**
(1) primary key ⊆ super key ⊆ candidate key
(2) primary key ⊆ candidate key ⊆ super key
(3) super key ⊆ candidate key ⊆ primary key
(4) super key ⊆ primary key ⊆ candidate key
Ans: b

Q Consider the following database table having A, B, C and D as its four attributes and four possible candidate keys (I, II, III and IV) for this table: **(NET-JULY-2016)**

A	B	C	D
a_1	b_1	c_1	d_1
a_2	b_3	c_3	d_1
a_1	b_2	c_1	d_2

I: {B} **II:** {B, C} **III:** {A, D} **IV:** {C, D}
If different symbols stand for different values in the table (e.g., d1 is definitely not equal to d2), then which of the above could not be the candidate key for the database table?
(1) I and III only **(2)** III and IV only **(3)** II only **(4)** I only
Ans. 3

Foreign Keys

- A foreign key is a column or group of columns in a relational database table that refers the primary key of the same table or some other table to represent relationship.
- The ***concept of referential integrity*** is derived from foreign key theory.

Which of the following key constraints is required for functioning of foreign key in the context of relational databases?

1. Unique key
2. Primary key
3. Candidate key
4. Check key

Q Let R1(a, b, c) and R2(x, y, z) be two relations in which a is the foreign key of R1 that refers to the primary key of R2. Consider following four options. **(NET-JULY-2018)**
(a) Insert into R1 **(b)** Insert into R2
(c) Delete from R1 **(d)** Delete from R2
Which of the following is correct about the referential integrity constraint with respect to above?
(1) Operations (a) and (b) will cause violation.
(2) Operations (b) and (c) will cause violation.
(3) Operations (c) and (d) will cause violation.
(4) Operations (d) and (a) will cause violation.
Ans: 4

Q A many-to-one relationship exists between entity sets r1 and r2. How will it be represented using functional dependencies if Pk(r) denotes the primary key attribute of relation r ? **(NET-JULY-2018)**
(1) Pk(r1) → Pk(r2) **(2)** Pk(r2) → Pk(r1)
(3) Pk(r2) → Pk(r1) and Pk(r1) → Pk(r2) **(4)** Pk(r2) → Pk(r1) or Pk(r1) → Pk(r2)
Ans: a

Q Referential integrity is directly relating to **(NET-DEC-2012)**
(A) Relation key **(B)** Foreign key
(C) Primary key **(D)** Candidate key
Ans: b

Q The following table has two attributes A and C where AA is the primary key and CC is the foreign key referencing AA with on-delete cascade.

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

The set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted is: **(GATE- 2005) (2 Marks)**

a) (3,4) and (6,4)
b) (5,2) and (7,2)
c) (5,2),(7,2) and (9,5)
d) (3,4),(4,3) and (6,4)

Ans: c

Q Drop Table cannot be used to drop a Table referenced by ___________ constraint. **(NET-JUNE-2015)**

(a) Primary key
(b) Sub key
(c) Super key
(d) Foreign key

(1)(a)
(2)(a), (b) and (c
(3)(d)
(4)(a) and (d)

Ans.3

Q Consider the following table consisting of two attributes A and B, where 'B' is the foreign key referring the candidate key 'A' with on – delete cascade option

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

When we delete the tuple (3 2), we need to delete few tuples additionally in order to preserve the referential integrity. The number of tuples that are remaining in the table when we delete (3 2) and additional tuples if necessary is _______

Q Consider the following tables T1 and T2.

T1

P	Q
2	2
3	8
7	3
5	8
6	9
8	5
9	8

T2

R	S
2	2
8	3
3	2
9	7
5	7
7	2

In table T1, **P** is the primary key and **Q** is the foreign key referencing **R** in table T2 with on-delete cascade and on-update cascade. In table T2, **R** is the primary key and **S** is the foreign key referencing **P** in table T1 with on-delete set NULL and on-update cascade. In order to delete record ⟨3,8⟩ from table T1, the number of additional records that need to be deleted from table T1 is _________. **(GATE- 2017) (1 Marks)**

As Q refers to R so, deleting 8 from Q won't be an issue, however S refers P. But as the relationship given is on delete set NULL, 3 will be deleted from T1 and the entry in T2 having 3 in column S will be set to NULL. So, no more deletions. Answer is **0**.

Q A recursive foreign key is a: **(NET-JUNE-2007)**

(A) references a relation

(B) references a table

(C) references its own relation

(D) references a foreign key

Ans: c

Composite key – composite key is a key composed of more than one column sometimes it is also known as concatenated key.

Secondary key – secondary key is a key used to speed up the search and retrieval contrary to primary key, a secondary key does not necessary contain unique values.

Q Find Candidate key in each of the follwing schema

Q R(ABCD)(AD, BD, CD)
A>B
B>C
C>A

Q R(ABCD)(AB, BD)
AB>CD
D>A

Q R(ABCDEF)(BF)
AB>C
C>D
B>AE
Q R(ABC)(AB, BC)
AB>C
C>A

Q R(ABCDEFGHIJ)(AB)
AB>C
A>DE
B>F
F>GH
D>IJ

Q R(ABCDEFGHIJ)(ABD)
AB>C
AD>GH
BD>EF
A>I
H>J

Q R(ABCDE)(CE)
CE>D
D>B
C>A

Q R(ABCDEFGH)(AE)
A>BC
ABE>CDGH
C>GD
D>G
E>F

....

Q R(ABCDE)(ACD, BCD, CDE)
A>B
BC>E
DE>A

Q R(ABCD)(AB, AD, BC, CD)
AB>CD
C>A
D>B

Q R(ABCDE)(ACD, BCD, CDE)
A>B
BC>E
DE>A

Q R(ABCDE)(AB, BC, BD)
AB>CD
D>A
BC>DE

Q R(ABCDE)(BC, CD)
BC>ADE
D>B

....

Q R(ABCDEF)(ABD, BCD)
AB>C
DC>AE
E>F

Q R(ABCDEF)(C, D, AB, BE, BF)
AB>C
C>D

D>BE
E>F
F>A

Q R(WXYZ)(Y, XW, XZ)
Z>W
Y>XZ
XW>Y

Q R(VWXYZ)(WYZ)

Z>Y

Y>Z

X>YV

VW>X

Q R(ABCDEF)(ABC, ACD)
ABC>D
ABD>E
CD>F
CDF>B
BF>D

Q R(ABCDE)

A>BC

CD>E

B>D

E>A

Q R(ABCDEF)

A>BCDEF

BC>ADEF

DEF>ABC

Q (NET-DEC-2018)

Consider a relation schema R = (A, B, C, D, E, F) on which the following functional dependencies hold :

$A \rightarrow B$

$B, C \rightarrow D$

$E \rightarrow C$

$D \rightarrow A$

What are the candidate keys of R ?

a) AE and BE
b) AE, BE and DE
c) AEF, BEF and BCF
d) AEF, BEF and DEF

Q Match the following with respect to RDBMS: **(NET-NOV-2017)**

(a) Entity integrity	**(i)** enforces some specific business rule that do not fall into entity or domain
(b) Domain integrity	**(ii)** Rows can't be deleted which are used by other records
(c) Referential integrity	**(iii)** enforces valid entries for a column
(d) User defined integrity	**(iv)** No duplicate rows in a table "

Code:

	a	b	c	d
1	iii	iv	i	ii
2	iv	iii	ii	i
3	iv	ii	iii	i
4	ii	iii	iv	i

Ans: 2

Q Let pk(R) denotes primary key of relation R. A many-to-one relationship that exists between two relations R1 and R2 can be expressed as follows: **(NET-JAN-2017)**

(1) pk(R2) → pk(R1)
(2) pk(R1) → pk(R2)
(3) pk(R2) → R1 ∩ R2
(4) pk(R1) → R1 ∩ R2

Ans: 2

Q A relation R = {A, B, C, D, E, F, G} is given with following set of functional dependencies: F = {AD → E, BE → F, B → C, AF → G} Which of the following is a candidate key? **(NET-DEC-2015)**

(1) A
(2) AB
(3) ABC
(4) ABD

Ans. 4

[AD]+ = ADE. [BE]+ = BCEF. [B]+ = BC. [AF]+ = AFG. Nothing drives all the attributes, but if We add B in first key i.e. [ADB] then it will give all the attribute [ADB]+ = ABCDEFG

Q Find the candidate key(s) of the relation R(UVWXYZ) with FD set F = {UV →W, XW → Y, U→ XZ, Y → U} **(NET-DEC-2015)**
a) XW **b)** UV, YV and WXV **c)** YUV, XV and WV **d)** None of these
Answer: (B)

Q Let R = {A, B, C, D, E, F} be a relation schema with the following dependencies
C → F, E → A, EC → D, A → B
Which of the following is a key for R? **(NET-DEC-2014)**
(A) CD **(B)** EC **(C)** AE **(D)** AC
Answer: (B)

Q Identify the minimal key for relational scheme R(A, B, C, D, E) with functional dependencies F = {A → B, B → C, AC → D} **(NET-DEC-2014)**
(A) A **(B)** AE **(C)** BE **(D)** CE
Answer: (B)

Q Consider the relation scheme R = (E, F, G, H, I, J, K, L, M, N) 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? **GATE (2014 SET 1)**
(a) {E, F} **(b)** {E, F, H} **(c)** {E, F, H, K, L} **(d)** {E}
Ans: b

Q Given the STUDENTS relation as shown below.

StudentID	*StudentName*	*StudentEmail*	*StudentAge*	*CPI*
2345	Shankar	shankar@math	X	9.4
1287	Swati	swati@ee	19	9.5
7853	Shankar	shankar@cse	19	9.4
9876	Swati	swati@mech	18	9.3
8765	Ganesh	ganesh@civil	19	8.7

For (StudentName, Student Age) to be the key for this instance, the value X should not be equal to_______________ **(GATE- 2014) (1 Marks)**
Ans 19

Q 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? **(GATE- 2013) (2 Marks)**

(A) 3 **(B)** 4 **(C)** 5 **(D)** 6

Answer: (B)

Q Consider a relation scheme R = (A, B, C, D, E, H) on which the following functional dependencies hold: {A–>B, BC–>D, E–>C, D–>A}. What are the candidate keys of R? **(GATE- 2005) (1 Marks)**

(A) AE, BE **(B)** AE, BE, DE **(C)** AEH, BEH, BCH **(D)** AEH, BEH, DEH

Answer: (D)

Q Consider a relational table with a single record for each registered student with the following attributes.

1. *Registration_Num*: Unique registration number of each registered student
2. *UID*: Unique identity number, unique at the national level for each citizen
3. *BankAccount_Num*: Unique account number at the bank. A student can have multiple accounts or join accounts. This attribute stores the primary account number.
4. *Name*: Name of the student
5. *Hostel_Room*: Room number of the hostel

Which one of the following option is **INCORRECT**? **(GATE- 2011) (1 Marks)**

A	BankAccount_Num is candidate key
B	Registration_Num can be a primary key
C	UID is candidate key if all students are from the same country
D	If S is a superkey such that S∩UID is NULL then S∪UID is also a superkey

Ans: a

Q A relation R = {A, B, C, D, E, F} is given with following set of functional dependencies:
F = {A→B, AD→C, B→F, A→E}
Which of the following is candidate key? **(NET-JUNE-2006)**

(A) A **(B)** AC **(C)** AD **(D)** None of these

Ans: d

Q Given a relation R(A,B,C,D,E,F) and set of functional dependency (FD)
F = {A →BC, C → E, E → F, F → AB,}. How many candidate keys does the relation R have?

a) 1 **b)** 3 **c)** 4 **d)** 5

Q Match the following: **(NET-JUNE-2013)**

a. Foreign keys	**i.** Domain constraint
b. Private key	**ii.** Referential integrity

c. Event control action model	**iii.** Encryption
d. Data security	**iv.** Trigger

Codes:

	a	**b**	**c**	**d**
a)	iii	ii	i	iv
b)	ii	i	iv	iii
c)	iii	iv	i	ii
d)	i	ii	iii	iv

Ans: b

Q Match the following: **(NET-DEC-2009)**

List-I	List-II
(1) Determinants	(a) No attribute can be added
(2) Candidate key	(b) Uniquely identified a row
(3) Non-redundancy	(c) A constraint between two attributes
(4) Functional dependency	(d) Group of attributes on the left-hand side of arrow of function dependency.

(A) 1 – d, 2 – b, 3 – a, 4 – c
(B) 2 – d, 3 – a, 1 – b, 4 – c
(C) 4 – a, 3 – b, 2 – c, 1 – d
(D) 3 – a, 4 – b, 1 – c, 2 – d

Ans: 1

Q ________ constraints ensure that a value that appears in one relation for a given set of attributes also appears for a certain set of attributes in another relation. **(NET-SEP-2013)**

(A) Logical Integrity
(B) Referential Integrity
(C) Domain Integrity
(D) Data Integrity

Ans: b

Q The student marks should not be greater than 100. This is **(NET-DEC-2013)**

(A) Integrity constraint
(B) Referential constraint
(C) Over-defined constraint
(D) Feasible constraint

Ans: a

Q In RDBMS, the constraint that no key attribute (column) may be NULL is referred to as: **(NET-JULY-2016)**

(1) Referential integrity
(2) Multi-valued dependency
(3) Entity Integrity
(4) Functional dependency

Ans. 3