

# DATABASE MANAGEMENT SYSTEMS

## Normalization

### Questions

1.

**Linked Question:**

**Common Data:**

A relation R is given as

Eid	Ename	PhoneNo
1	Rakesh	9980734567
		9524312988
2	Ram	8798214587
		08632374568
3	Ravi	9887653540
		040225678

(i) What is the highest normal form satisfying above relation?

(a) 1NF

(b) 2NF

(c) 3NF

(d) None

(ii) If the above relation is converted into 1NF, what will be the number of rows in the resulting relation? (Assume we can create only one relation)

(a) 9

(b) 7

(c) 8

(d) 6

2. Given relation R(ABCDE) with FD set  $F = \{AB \rightarrow CDE, A \rightarrow C, E \rightarrow AB\}$ . What is the normal form of the above relation?

(a) 1NF

(b) 2NF

(c) 3NF

(d) BCNF

3. Given relation  $R = ABCD$  with  $BD$  as primary key. Which functional dependency violates 3NF?

- (a)  $A \rightarrow C$
- (b)  $B \rightarrow D$
- (c)  $BD \rightarrow A$
- (d)  $BD \rightarrow C$

4. The highest normal form of the relation  $R(A, B, C, D)$ , if the following FD's are satisfied by relation:  $F: \{AB \rightarrow D, AC \rightarrow BD, B \rightarrow C\}$

- (a) BCNF
- (b) 3NF
- (c) 2NF
- (d) 1NF

5. A prime attribute of a relation schema  $R$  is an attribute that appears

- (a) In all candidate keys of  $R$
- (b) In some candidate key of  $R$
- (c) In a foreign key of  $R$
- (d) Only in the primary key of  $R$

6. Given an Instance of the STUDENTS relation as shown below:

Student ID	Student Name	Student Email	Student Age
2345	Sowmya	Sowmya@math	X
1287	Akshaya	Akshaya@ee	19
7853	Sowmya	Sowmya@cse	19
9876	Akshaya	Akshaya@mech	18
8765	Rahul	Rahul@civil	19

For (StudentName, StudentAge) to be a key for this instance, the value  $X$  should not be equal to

- (a) 18
- (b) 19
- (c) 20
- (d) None

7. A relation  $R(ABCDE)$  is given with the FD set  $F: \{A \rightarrow BC, BC \rightarrow D, D \rightarrow E\}$

(i) Above relation can be decomposed into 2NF without violating dependency preservation.

(ii) Above relation can be decomposed into 3NF without violating dependency preservation.

(a) I, II are correct

(b) I is correct, II is wrong

(c) I, II are wrong

(d) I is wrong, II is correct

### Linked Question

#### Common Data:

8. Given  $R(ABCDEFGHIJ)$  with FD's  $F = \{A \rightarrow BC, C \rightarrow D, E \rightarrow FG, H \rightarrow IJ\}$

(i) How many number of candidate keys are there?

(a) 1

(b) 2

(c) 3

(d) 4

(ii) What is the normal form of the above relation?

(a) 1NF

(b) 2NF

(c) 3NF

(d) BCNF

9. Consider the relation schema of the relation SCHEDULE shown below. What is the highest normal form of this relation?

SCHEDULE (Stud\_ID, Class, Stud\_Name, Stud\_Major, Class\_Time, Building, Room, Instructor)

Assume the following functional dependencies

$\text{Stud\_ID} \rightarrow \text{Stud\_Name}$

$\text{Stud\_ID} \rightarrow \text{Stud\_Major}$

$\text{Class} \rightarrow \text{Class\_Time}$

$\text{Class} \rightarrow \text{Building, Room}$

$\text{Class} \rightarrow \text{Instructor}$

(a) BCNF

(b) 3NF

(c) 2NF

(d) 1NF

10. Given  $R = ABCD$  with FD  $BC \rightarrow D$ ; under what conditions  $R$  is to be in BCNF?

(a)  $C$  is not a key for  $R$

(b)  $B$  is a key for  $R$

(c)  $D$  is a key for  $R$

(d)  $CD$  is a key

11. Consider the relational schema  $R(ABCDEFGH)$  and the FD's  $\{A \rightarrow BC, C \rightarrow D, E \rightarrow A, F \rightarrow GH\}$ . Is the decomposition of  $R$  into  $(EABCD)(FGH)(EF)$  is

I. Lossless

II. Lossy

III. Dependency preserving

IV. Not dependency preserving

(a) I & III

(b) I & IV

(c) II & III

(d) None

12.  $R(ABCD)$  is a relation. Which of the following FDs while holding on ' $R$ ' does not has either lossless join or dependency preserving BCNF decomposition?

(a)  $A \rightarrow B, C \rightarrow D$

(b)  $AB \rightarrow C, B \rightarrow C, C \rightarrow D$

(c)  $AC \rightarrow D, A \rightarrow BC$

(d)  $AB \rightarrow CD, C \rightarrow A$

13. Given  $R = ABCDE$  and FD set  $\{AB \rightarrow CD, E \rightarrow A, D \rightarrow E\}$ . If we decompose into BCNF, how many tables we will get?

(a) 2

(b) 3

(c) 4

(d) 5

14. From the following instance of a relation schema  $R(A, B, C)$  we can conclude that

A	B	C
$a_1$	$b_1$	$c_1$
$a_1$	$b_1$	$c_2$
$a_2$	$b_2$	$c_3$
$a_2$	$b_2$	$c_3$

- (a) A functionally determines B and B functionally determines C.
- (b) A functionally determines B and B does not functionally determines C.
- (c) B does not functionally determine C.
- (d) A does not functionally determines B and B does not functionally determines C.

15. Which of the following statements is false?

- (a) Any relation with 2 attributes is in BCNF.
- (b) Any relation in which every key has only one attribute is in 2NF.
- (c) A prime attribute can be transitively dependent on a key in a 3NF relation.
- (d) A prime attribute can be transitively dependent on a key in a BCNF relation.

16. Given relation schema  $R(ABCDEH)$  with FD's :  $\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$ . Find candidate keys for relation R.

- (a) AE, BF, DE
- (b) AEH, BEH, DEH
- (c) AEH, BEH, CEH, DEH
- (d) AE, BE, CE

17. A relation  $R(ABCDE)$  and the dependency set

$F = \{AB \rightarrow CD, C \rightarrow DE, A \rightarrow B\}$ . Find the normal form of above relation.

- (a) 2NF
- (b) 1NF
- (c) 3NF
- (d) BCNF

18. A relation  $R(ABCDE)$  and the dependency set  $F = \{A \rightarrow B, C \rightarrow D, A \rightarrow E\}$ .

Can you decompose the above into BCNF without violating dependency preservation?

- (a) Yes
- (b) No
- (c) Can't say
- (d) None

19. A decomposition of a relation schema  $R \langle S, F \rangle$  into relation schemas  $R_i (1 \leq i \leq n)$  then if for every relation state  $r$  of  $R$ ,  $R \subset \Pi_{R_1}(r) \bowtie \Pi_{R_2}(r) \bowtie \Pi_{R_3}(r) \dots \dots \dots \bowtie \Pi_{R_n}(r)$ , then such a decomposition is called

- (a) dependency preserving
- (b) lossy
- (c) Neither (a) nor (b)
- (d) Both (a) and (b)

20. Given  $R=ABCDE$  and FD's  $:\{AB \rightarrow CDE, C \rightarrow A, D \rightarrow E\}$ . If we decompose into BCNF, it is FD preserving.

- (a) Yes
- (b) No
- (c) Can't say
- (d) None