

# 9

## Database Management System

### Practice Questions

#### Key Concepts and functional Dependency

**Q.1** The functional dependencies over the attribute set (ABCDEFHT) is

$A \rightarrow E$

$BE \rightarrow D$

$AD \rightarrow BE$

$BDI \rightarrow E$

$AC \rightarrow E$

$F \rightarrow A$

$E \rightarrow B$

$BH \rightarrow F$

$CD \rightarrow A$

How many FD's minimal cover \_\_\_\_\_.

**Q.2** Consider The relation  $R(A,B,C,D,E)$  and the following functional dependencies

$A \rightarrow B$

$B \rightarrow C$

$C \rightarrow D$

$D \rightarrow E$

$B \rightarrow A$

How many super key's are possible \_\_\_\_\_?

**Q.3** Consider the following statement about functional dependency

$S_1 : X \rightarrow Y$  is not trivial if  $X \cap Y = \phi$

$S_2 : X \rightarrow Y$  is semi trivial if  $X \cap Y \neq \phi$

Which of the following statements is/are false?

(A)  $S_1$  only

(B)  $S_2$  only

(C) Both  $S_1$  and  $S_2$

(D) None

**Q.4** How many candidate keys for the relation  $R(A,B,C,D,E)$  and functional dependencies

$A \rightarrow B$

$BC \rightarrow E$

$ED \rightarrow A$

**Q.5** Consider the following relation  $R(A,B,C,D,E)$

$A \rightarrow B$

$B \rightarrow C$

$D \rightarrow E$

How many super keys are there \_\_\_\_\_.

**Q.6** Consider Relation

$R(A,B,C,D,E,F,G,H)$  with two candidate keys {AB, BE} Find out total number of super keys?

**Q.7** Consider Relation  $R(A,B,C,D,E,F,G)$  with two candidate keys AB and DE Find out total number of super keys?

**Q.8** Consider Relations  $R(A,B,C,D,E,F,G)$  with the following candidate keys {A}, {B} and {E}. How many super keys are there?



**Q.9** Consider Relation  $R(A,B,C,D)$  with the following Functional dependency set  $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow A\}$ . How many Super keys for Relation  $R$  is possible?

**Q.10** Consider the following two Relations  $R(A,B,C,D)$  and  $S(\underline{D},E,F)$ . Underline in Relation Shows Primary key of respective relation and  $D$  is foreign key in  $R$ , that references Primary key in  $S$ . Which of the following will cause violation? **[MSQ]**

- (A) Insertion of record into  $R$
- (B) Insertion of record into  $S$
- (C) Deletion of record from  $S$
- (D) Deletion of record from  $S$

**Q.11** Consider Relation  $R(A,B,C,D,E)$  with FD set

$\{A \rightarrow BC, C \rightarrow E, D \rightarrow B, B \rightarrow C\}$

What are relationship between closures of  $A$  ( $A^+$ ) and closure of  $C$  ( $C^+$ )?

- (A)  $A^+ \subseteq C^+$  (B)  $A^+ \supseteq C^+$
- (C)  $A^+ = C^+$  (D) None of these

**Q.12** Consider the following Relation  $R(A,B,C,D)$  with FD's **[MSQ]**

$AB \rightarrow C$

$A \rightarrow D$

Assume domain for

$D = \{a, b, c, d, e, f, g\}$

$A = \{h, i, j, k\}$

The missing values inserted Corresponding to Attribute  $A$  and  $D$  in the table are respectively \_\_\_\_\_.

A	B	C	D
h	e	e	a
h	i	f	a
j	d	f	
	k	e	c
i	k	e	d

- (A)  $k$  and  $a$  (B)  $k$  and  $d$
- (C)  $i$  and  $b$  (D)  $i$  and  $a$

**Q.13** In a Instance of Relation  $R(P,Q,R,S,T)$  shown below Which of the following functional dependencies hold?

P	Q	R	S	T
10	30	20	40	50
10	40	20	40	50
10	30	40	40	10

(I)  $PQ \rightarrow R$

(II)  $Q \rightarrow S$

(III)  $ST \rightarrow P$

- (A) I only (B) II only
- (C) I and II only (D) II and III

**Q.14** The functional dependency

$P \rightarrow Q, SQ \rightarrow R$  implies

- (A)  $PS \rightarrow R$  (B)  $P \rightarrow R$
- (C)  $Q \rightarrow P$  (D)  $SQ \rightarrow P$

**Q.15** Consider the Relation  $S(A,B,C,D,E)$  with FD's  $AB \rightarrow C, B \rightarrow D, DE \rightarrow A$

How many candidate key of Relation  $S$ ?

- (A) 1 (B) 2
- (C) 3 (D) 4

**Q.16** Consider the following set of FDs.

$F = \{P \rightarrow R, PR \rightarrow S, T \rightarrow PS, T \rightarrow V\}$

$G = \{P \rightarrow RS, T \rightarrow PV\}$

Which of the following is true

- (A)  $F \equiv G$  (B)  $F \supset G$
- (C)  $F \subset G$  (D)  $F \not\equiv G$

### Functional Dependency

**Q.17** Consider a relation  $R(A,B,C,D)$  with functional dependency set

$\{A \rightarrow B, B \rightarrow C, CD \rightarrow A, CD \rightarrow B\}$

Consider the following decompositions:

$D_1 : R_1(A,B,C)R_2(B,C,D)$

$D_2 : R_1(A,B)R_2(B,C)R_3(A,C,D)$

Which of the following statements is/are false? [MSQ]

- (A)  $S_1 : D_1$  is loss less join
- (B)  $S_2 : D_1$  is lossy join
- (C)  $S_3 : D_2$  is loss less join
- (D)  $S_4 : D_2$  is lossy join

**Q.18** Consider the following relation  $R(A, B, C, D, E, F, G, H, I, J)$  and set of FD's

$\{HI \rightarrow J, H \rightarrow EF, I \rightarrow G, G$

$\rightarrow CD, E \rightarrow AB\}$  the decomposition of

$R$  is (HIJEF), (IGCD) and (EAB)

So the decomposition is

- (A) 1 NF
- (B) 2 NF
- (C) 3 NF
- (D) BCNF

**Q.19** Consider the following relation and functional dependencies:

$R(A, B, C, D, E, F, G)$

$A \rightarrow D$

$AE \rightarrow G$

$DF \rightarrow BC$

$E \rightarrow C$

$G \rightarrow E$

Select the highest Normal form for the following 3 decomposition of relation (AD), (EC), (A,B,E,F,G)

- (A) BCNF
- (B) 2NF
- (C) 3NF
- (D) None of these

**Q.20** Let relation is  $R(A, B, C, D, E)$  and following function dependencies

[MSQ]

$ABC \rightarrow D$

$ABC \rightarrow E$

$D \rightarrow A$

$E \rightarrow B$

The Normal form satisfied by  $R$  is

- (A) 1 NF
- (B) 2 NF
- (C) 3 NF
- (D) BCNF

**Q.21** Consider the relation  $R(A, B, C, D, E)$  with the following dependencies

$AB \rightarrow D$

$AB \rightarrow E$

$D \rightarrow A$

$D \rightarrow B$

Which of the following is true?

- (A) Relation is in BCNF
- (B) Relation is in 3NF but not in BCNF
- (C) Relation is in 2NF but not in 3NF
- (D) None of these

**Q.22** Consider Relation  $R(A_1, A_2, A_3, A_4, A_5)$  with

$FD's : \{A_1 \rightarrow A_2, \rightarrow A_3, A_1 A_3 \rightarrow A_4\}$

If the relation decompose into 3NF relation then how many relations will generate\_\_\_\_\_.

**Q.23** Consider the relation  $R(ABCDE)$  and set of functional dependencies are

$A \rightarrow ABCDE$

$B \rightarrow C$

Which of the following is true?

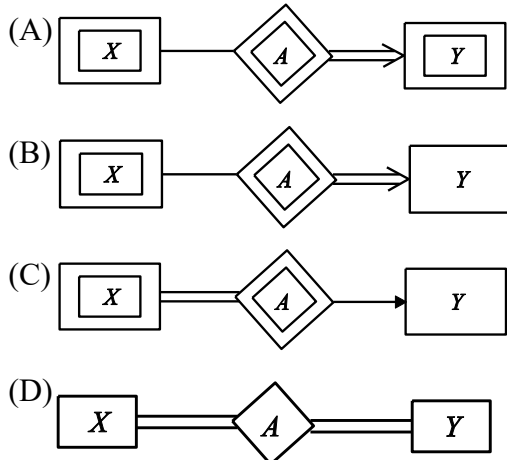
- (A) The decomposition in  $R_1(ACDE)$  and  $R_2(BC)$  are in BCNF, lossless dependency preserving.
- (B) The decomposition in  $R_1(ABE)$  and  $R_2(BC)$  are in BCNF, lossless dependency preserving.
- (C) The decomposition in  $R_1(ABDE)$  and  $R_2(BC)$  are in BCNF, lossless dependency preserving.
- (D) None of the above

**Q.24** Relation  $R(A, B, C, D, E)$  has following FDs  $\{A \rightarrow BC, C \rightarrow E, D \rightarrow B, B \rightarrow C\}$  What is highest Normal form of  $R$  ?

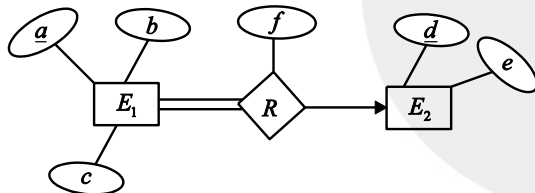
- (A) 1 NF
- (B) 2 NF
- (C) 3 NF
- (D) BCNF

## ER Diagram

**Q.25** Which of the following ERD does not have an error? [MSQ]



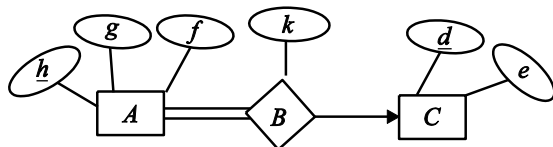
**Q.26** Consider following ER Diagram



Which of the following attributes can be primary key of relationship R?

- (A) a and d
- (B) a, d and f
- (C) a and f
- (D) None of these

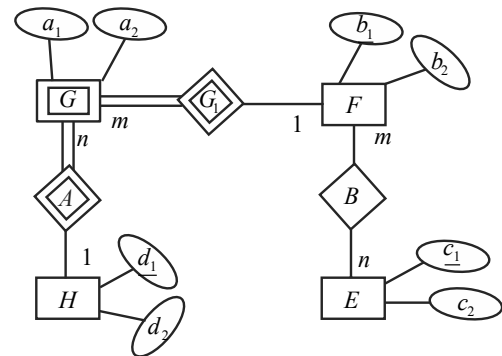
**Q.27** Consider following ERD



Which of the following attribute (s) can be primary key for relation A.

- (A) {h,d}
- (B) {h,d,k}
- (C) {h}
- (D) (A) and (B) both

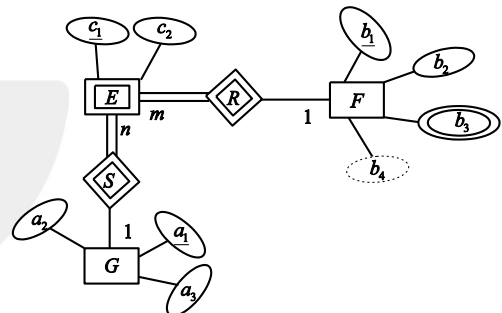
**Q.28** Consider the following ERD



Which of the following is not a key for any table in Relational model.

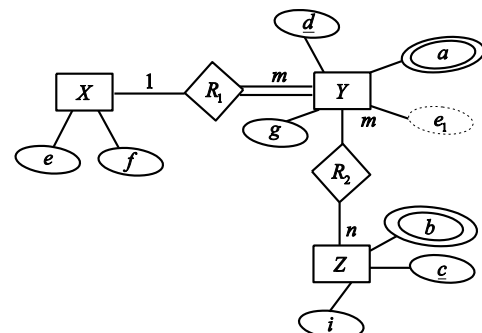
- (A) {a<sub>1</sub>, b<sub>1</sub>, d<sub>1</sub>}
- (B) {b<sub>1</sub>, c<sub>1</sub>}
- (C) {a<sub>1</sub>, b<sub>1</sub>}
- (D) {c<sub>1</sub>}

**Q.29** Consider the following ERD

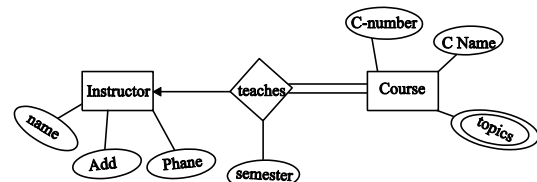


Relational model of above ERD contain total x tables and y attributes then  $x + y = \underline{\hspace{2cm}}$ .

**Q.30** How many table will have for the following E-R diagram?



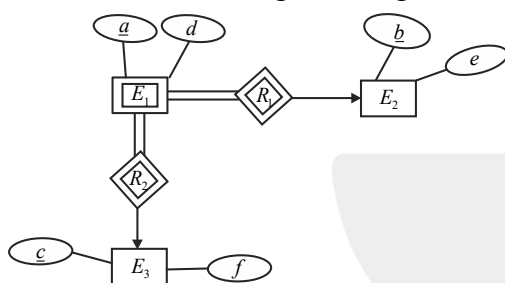
**Q.31** Consider following ER-Diagram



Which of the following statements is/are true? [MSQ]

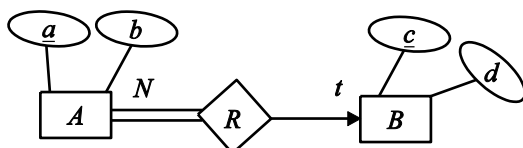
- (A) Every course has an instructor
- (B) Course is totally participate in the relation
- (C) An instructor can teach many courses.
- (D) There is no table for Relationship teaches and attribute of teaches added in the table of Entity set course

**Q.32** Consider the following E/R diagram.



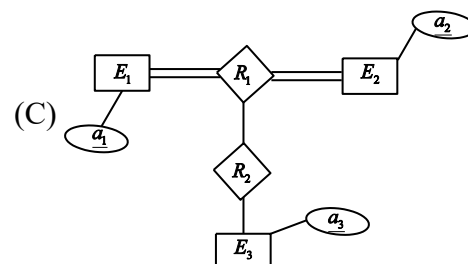
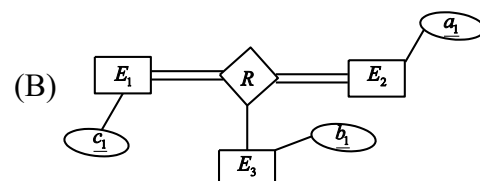
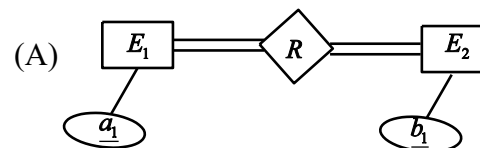
How many total number of attributes in the relational Schema's if the following E-R diagram is map to relational schema's

**Q.33** Which of the following statement is/are false for given E-R diagram [MSQ]



- (A) Table for Entity A should have a larger number of attributes
- (B) Table for Entity B should have a larger number of attributes
- (C) Both table of A and B should have, same number of attributes
- (D) Total number of tables in Relational model for ER Diagram Relational model for Diagram is 2

**Q.34** Which of the following is incorrect ERD?



(D) None of these

**Q.35** When mapping ER diagram of two Entity type A and B are related by 1:1 relationship which is in total participation at both ends. Then which of the following is True.

- (A) Use a primary key which is a composition of primary keys of A and B
- (B) Combine A and B together into a single relations
- (C) Keep them separate and put foreign key in Both A and B
- (D) None of these

### Relational Algebra

**Q.36** Consider the following three Relation R,S,T

R		S		T	
A	B	B	C	A	C
1	2	2	3	1	3
2	1	1	4	3	3
3	2	2	5	4	5
4	2	2	5	4	3
5	3	3	6	5	6

How many tuple selected 'by following Relational Algebra Query ?

$$\pi_{A,C}(R \bowtie S) - \pi_{A,C}(T)$$

- Q.37** Consider relations  $P(A,B)$  and  $S(B,C)$  where number of tuple in P is 40000 and in S is 20000 where B is key an S. Then the number of tuples in R Natural join S is less then or equal to

(A) 40000 (B) 80000  
(C) 20000 (D) None of these

- Q.38** Consider following relations P(A,B) and Q (B,C,D) Let.  $R = P \times_{P.B=Q.B \wedge P.A < Q.C} Q$  which of the tuple belongs to "R"?

[MSQ]

P

A	B
2	p
8	r
3	i
5	t
10	r

Q

B	C	D
t	6	7
p	8	9
r	9	10

- (A) (8, r, r, 7, 8)  
(B) (2, p, p, 8, 9)  
(C) (5, t, t, 6, 7)  
(D) (8, r, r, r, 9, 10)

- Q.39** If A is candidate key of Relation R and B is other number attribute of R Let r be the number of tuples in table R.

Then How many tuple will result from the given the given relational algebra.

$$(\pi_A(\sigma_{B < 4}(R))) * (\pi_A(\sigma_{B \geq 4}(R)))$$

NOTE:- "\*" is Natural Join

- (A) 0 (B) 1  
(C) r (D) 1/r

- Q.40** Consider the following relation, P, Q, R

P	A	B	Q	B	C	R	A	C
	2	3		7	3		8	2
	4	3		3	5		2	3
	6	7		9	2		10	4
	8	9		9	4		6	5
	10	9		3	6		4	6

How many rows in resulting table of  $\pi_{A,B}(P * Q) * \pi_{A,C}(Q * R)$  where "\*" is Natural join

- Q.41** Consider the Following Relations R and S.

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

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

How many tuples selected by following R.A. Query?

$$(\pi_{x,y,z}(R) - \pi_{x,y,z}(S)) \cup$$

$$(\pi_{x,y,z}(S) - \pi_{x,y,z}(R))$$

- (A) 2 (B) 4  
(C) 6 (D) None

#### Tuple Relational Calculus

- Q.42** Consider the following query

$$S_1 : \{S \mid S \notin \text{Employee}, S.\text{rating} > 10\}$$

$$S_2 : \{S \mid S \notin \text{Employee}\}$$

$$S_3 : \{S \mid S \in \text{Employee} \wedge S \in \text{department}\}$$

$$S_4 : \{S \mid \sim \exists S \in \text{Employee} \wedge S.\text{rating} = 10\}$$

$$S_5 : \{S \mid S \notin \text{department}\}$$

How many queries are unsafe?

**Q.43** Consider the following Queries

[MSQ]

$S_1$  : Select distinct A,B from R where C = 20 and B = 10;

$S_2$  :  $\pi_{A,B}(\sigma_{\substack{C=20 \\ B=10}}(R))$

$S_3$  :  $\{t.A, t.B \mid t \in R \wedge t.C = 20 \wedge t.B = 10\}$

$S_4$  :  $\{ \langle a, b \rangle \mid \langle a, 10, 20, d \rangle \in R \}$

Assume R(A,B,C,D) is a Relation.

Which of the following is/are true?

(A)  $S_1$  and  $S_2$  are Equivalent

(B)  $S_2$  and  $S_3$  are Equivalent

(C)  $S_3$  and  $S_4$  are Equivalent

(D)  $S_4$  and  $S_1$  are Equivalent

**Q.44** Consider the following Relational Schema

Student (rollno, name, degree, year, sex, deptNo, advisor)

Department (Deptid, name, hod, mobile)

Which of the following tuple calculus query determine the departments that do not have any girl students

(A)  $d.name \mid \text{department } (d) \wedge \neg(\exists S)$   
 $(\text{Student } (S) \wedge S.Sex = 'F' \wedge S.deptNO = d.dept id)$

(B)  $d.name \mid \text{department } (d) \wedge (\exists S)$   
 $(\text{Student } (S) \wedge S.Sex = 'F' \wedge S.deptNO = d.dept id)$

(C)  $d.name \mid \text{department } (d) \wedge \neg(\text{Student } (S) \wedge \neg S.Sex = 'F' \wedge S.deptNO = d.dept id)$

(D)  $d.name \mid \text{department } (d) \wedge (\text{Student } (S) \wedge \neg S.Sex = 'F' \wedge S.deptNO = d.dept id)$

**Q.45** Consider the Relation R(A,B,C) and S(C,D,E) and the Following queries over R and S.

(I) Select distinct A, E from R,S where R.C = S.C;

(II)  $\{ \langle A, E \rangle \mid \exists C (\langle A, B, C \rangle \in R \wedge \langle C, D, E \rangle \in S) \}$

(III)  $\pi_{A,E}(R \bowtie S)$

Which of the following is/are equivalent?

(A) I, II only

(B) I and II Only

(C) II and III only

(D) I, II and III

**Q.46** Consider relation R with non atomic attributes

A	B	C	D
E1	B1	C1	D1
	C1	C2	D2
		C3	
E2	B2	C1	D1
		C2	D3
E3	B1	C4	D1
	B2		D4
E4	B5	C1	D1
			D3

Above relation is not satisfy the properties of 1 NF. If the above relation is converted to 1NF what will be the number of rows in the resulting relation \_\_\_\_\_.

**Q.47** Consider the Relation R(P,Q) with FD  $P \rightarrow Q$  and consist two tuples T1, T2 the following statement is/are true?

[MSQ]

(A) If T1, T2 agree for attribute P then must be agree for attribute Q.

(B) If T1, T2 agree for attribute P then they need not be agree for attribute Q.

(C) If T1, T2 disagree for attribute P then they may or may not be agree for attribute Q.

(D) If T1, T2 agree for attribute P then they need not be agree for attribute Q.

## SQL

**Q.48** Consider the following tables.

<i>P</i>		<i>Q</i>		<i>R</i>	
<i>x</i>	<u><i>a</i></u>	<i>a</i>	<u><i>c</i></u>	<i>b</i>	<i>c</i>
1	<u>2</u>	2	<u>2</u>	1	2
2	<u>3</u>	3	<u>3</u>	2	3

Here  $Q(a)$  refers to  $P(a)$  with on delete cascade to preserve referential integrity constraint

Similarly  $R(c)$  refers to  $Q(c)$  with on delete set Null to preserve referential integrity constraint.

After Executing the following SQL Query Delete from P;

What tuples will R Contain?

- (A) (1, null) and (2,3)
- (B) (1, null) and (2, null)
- (C) (1, null) only
- (D) (2, null) only

**Q.49** Consider Relation  $R(\underline{A}, B, C, D)$  where A is Primary key.

$Q_1$  : Select count (\*) from R;

$Q_2$  : Select count (A) from R;

Which of the following is true?

- (A)  $Q_1$  and  $Q_2$  Produce same output
- (B) Output of  $Q_1$  is subset of output of  $Q_2$
- (C) Output of  $Q_2$  is subset of output of  $Q_1$
- (D) None of these

**Q.50** Consider the relation declared by create table S(name Varchar (30)primary key), salary int check (Salary<= 500000); initially relation has 3 records

Name	Salary
Scott	200000
Smith	300000
Joe	400000

Now we are execute following sequence

- (1) Insert into S values ('fred', 150000);
  - (2) Update S set salary = 600000 where name = 'Joe';
  - (3) Insert into S values ('Scott', 160000);
  - (4) Delete from S where name = 'Smith'
- At the end of these statements, the sum of the salaries over all table in S is :

- (A) 650000
- (B) 950000
- (C) 750000
- (D) 910000

**Q.51** Consider following SQL queries to relations  $A(a,b), B(b,c)$

Q1: Select \* from A Natural Join B;

Q2: Select \* from A left outer Join B;

Which of the following is correct?

- (A) Both Q1 and Q2 produce same answer
- (B) Answer of Q1 always contained in the answer of Q2
- (C) Answer of Q2 always contained in the answer of Q1
- (D) Both Q1 and Q2 produce different answer.

**Q.52** Consider the following SQL [MSQ]  
Create table P(a varchar(10) primary key , b varchar (2))

Create table Q (c varchar (10) primary key, a varchar (10))

references T (a) on delete cascade)

Create table R(d varchar (10) primary key, C varchar (10) references Q(c) an delete set null);

Suppose table P,Q and R is

P	<b>a</b>	<b>b</b>
	10	10
	20	10

Q	<b>c</b>	<b>a</b>
	10	10
	20	10

R	<b>d</b>	<b>c</b>
	10	10
	20	20

Which of the following will cause an error





- (A) Insert into Q values (20, 30);  
(B) Insert into R values (20, 30);  
(C) Delete from P where a = 20;  
(D) Delete from Q where a = 10;

**Q.53** Consider the following Relation Schemas:

P	A	B	Q	B	C
	b	c		c	f
	b	d		e	i
	d	e		c	g
	c	f		b	e
	b	k		b	f

How many number of rows produce by following SQL

Select P.A count (Q.C) as C-count from P,Q where P.A = Q.B group P.A

- (A) 1 (B) 3  
(C) 2 (D) None

**Q.54** The output given SQL is:

Select name from student where name like '% P% S%';

- (A) The name of student such that it always contain P and S Simultaneously.  
(B) The name of student such that it always contain P and it followed by at least two S.  
(C) The name of student such that it always contain P and S  
(D) The name of student that start with P and end with S

**Q.55** Consider the instance of Relation R and Relation S.

R		S
A	B	B
1	10	10
2	20	20
3	10	30
4	10	

3	30
2	10
1	20
1	30
2	30
4	20

How many tuples return by following SQL Query.

Select A from R as  $r_1$  where  
not exist ((select S.B from S) Except  
(select  $r_2.B$  from R as  $r_2.A = r_1.A$ ));

**Q.56** Consider the following Relations

[MSQ]

Employees (Eno, Ename, Dno)

Project (Pno, Pname)

Wok on (Eno, Pno)

Which of the following query given name of all Employees who work on all projects

(A)  $T_1 \leftarrow \pi_{pno}(\text{Project})$

$T_2 \leftarrow \pi_{eno}(\text{Workon} \div T_1)$

$\pi_{ename}(\text{Employee} \bowtie T_2)$

(B) Select Ename from Employee as e where not Exist ((Select Pro from project)except (select pro from work-on where Eno = e.Eno));

(C) Select Ename from Employee as e where Eno not in (Select W. Eno from (Select W.Eno, Pno from(select pno from project as P cross join (select distinct Eno from work-on)as w) Except (Select Eno, Pno from work-an)as r);

(D) Select Ename from Employee as e where Exist ((Select pro from project) except (Select pno from work-on where Eno = e.Eno));



- Q.57** Consider a Relation R(ENo, EName, Age, DNo) Where ENo is primary key and EName with Not NULL Constraint. Consider a status of Relation R at time

[MSQ]

ENo	EName	Age	DNo
1	LUV	25	101
2	KUSH	19	102
3	Rohit	12	103

- Which of the following will cause error?
- (A) Insertion of (3, Ramesh, 25, 103)  
 (B) Insertion of (12, Rohit, 12, 103)  
 (C) Insertion of (5, NULL, 12, 103)  
 (D) Insertion of (2, Ravi, 8, 105)
- Q.58** Which of the following SQL queries is illegal?
- (A) Select count (\*) from S;  
 (B) Select A, count (\*) from S;  
 (C) Select A, count (\*) from S group by A;  
 (D) None of these.

#### Transaction and Serializability

- Q.59** Consider the following schedule, S
- $$S = \{r_1(x), r_2(x), r_3(y), w_1(x), r_2(z), r_2(y), w_2(y), w_1(z)\}$$
- Is conflict – equivalent to which of the following serial schedules.
- (A)  $T_3, T_1, T_2$                       (B)  $T_2, T_3, T_1$   
 (C)  $T_3, T_2, T_1$                       (D)  $T_2, T_1, T_3$
- Q.60** Consider the following schedule's
- $S1: r_1(x), r_2(z), r_1(z), r_3(x), r_3(y), w_1(x), w_3(y), r_2(y), w_2(z), w_2(y)$
- $S2: r_1(x), r_2(z), r_3(x), r_3(y), w_1(x), w_3(y), w_1(x), w_2(z), w_3(y), w_2(y)$

Which of the following is conflict serializable?

- (A) Only  $S1$   
 (B) Only  $S2$   
 (C) Both  $S1$  and  $S2$   
 (D) Neither  $S1$  or  $S2$

- Q.61** Suppose we are using time stamp based concurring control, and there are two transaction  $T_1$  And  $T_2$  with timestamp 10 and 20. They are try to execute following sequence of instruction.

$r_1(x); r_2(y); w_1(y); w_2(x);$

Which of the following is true

- (A) Both transaction  $T_1$  and  $T_2$  execute successfully.  
 (B)  $T_1$  needs to rollback  
 (C)  $T_2$  needs to rollback  
 (D) None of these

- Q.62** Suppose a transaction  $T_1$  is failed due to system error. Which of the following can be used to recover the schedule.

- (A) log file                      (B) Error file  
 (C) Both a and b                      (D) None of these

- Q.63** The Schedule
- $$S = \{W_1(A), R_2(A), W_2(A), W_1(A), R_3(B), W_3(B), W_2(B), R_1(B)\}$$
- is

- (A) Conflict Serializable  
 (B) View Serializable  
 (C) Both (A) and (B)  
 (D) None of these

- Q.64** Consider the sequence of instruction of transactions,  $T_1, T_2$  and  $T_3$

$r_1(x); r_2(y); w_1(z); r_3(y)$   
 $r_3(z); w_2(y); w_3(x);$

Assume that read – and write timestamp of x, y, and z are each zero before the execution of given instruction, Transaction abort because of the timestamp rule.

(A)  $TS(T_1) = 1000; TS(T_2) = 2000$

$TS(T_3) = 3000$

(B)  $TS(T_1) = 3000; TS(T_2) = 2000$

$TS(T_3) = 1000$

(C)  $TS(T_1) = 1000; TS(T_2) = 3000$

$TS(T_3) = 2000$

(D) None of these

**Q.65** Consider the following schedule

$S = \{R_1(A), W_1(A), R_2(A),$

$R_1(B), W_2(A), W_1(B), C_1,$

$R_2(B), W_2(B), C_2\}$

(i) Schedule S in conflict serializable

(ii) Schedule S is recoverable

(iii) Schedule S is Cascadeless

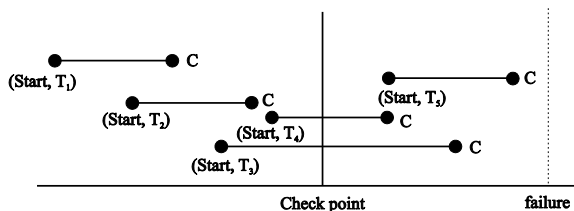
(A) i only

(B) i and ii only

(C) ii and iii only

(D) None of there

**Q.66**  $T_1, T_2, T_3, T_4, T_5$  are transactions



How many transaction is in undo list  
 (Note: Using check point Algorithm)

(A) 2

(B) 3

(C) 1

(D) None of these

**Q.67** Consider the following schedule

S	
$T_1$	$T_2$
R(A)	
$A = A - 50$	
	R(A)
	$A = A + 50$
W(A)	
	W(A)
Commit	
	W(A)
	Commit

The above schedule is suffer from

(A) Lost update

(B) Dead lock

(C) Unrepeatable read

(D) None of these

**Q.68** Consider the following two statements

$S_1$  : A schedule S is called recoverable if  $T_i$  writes a data item whose value  $T_j$  reads, then  $T_i$  must commit before  $T_j$  does.

$S_2$  : A schedule S is called cascadeless if  $T_i$  depends on  $T_j$  then

$T_i$  should read committed date of  $T_j$

(A)  $S_1$  only

(B)  $S_2$  only

(C) Both A and B

(D) None of these

**Q.69** The schedule

$S = \{R_1(A), W_2(A)W_1(A),$

$W_3(A), C_1, C_2, C_3\}$

(A) Conflict Serialzable

(B) View serializable

(C) Recoverable

(D) Cascadeless



**Q.70** Consider the following schedules:-

$S_1 : R_1(x)W_2(x)C_2R_1(x)$

$S_2 : W_1(x)R_2(x)R_1$

Note  $C_2$  = Commit by  $T_2$

$R_1$  = Rollback by  $T_1$

- (A)  $S_1$  and  $S_2$  both have lost update problem
- (B)  $S_1$  has unrepeatable read and  $S_2$  has dirty Read problem
- (C)  $S_1$  and  $S_2$  both have dirty Read Problem
- (D) None of these

**Q.71** Consider the following Schedules:-

$S_1 : R_1(x)W_2(y)R_2(x)W_1(y)C_1$

$S_2 : R_1(x)R_2(y)W_1(z)C_1R_3(y)$

$R_3(z)W_2(y)W_3(x)C_2C_3$

Which of the following statement is correct

- (A)  $S_1$  and  $S_2$  both possible under 2PL
- (B)  $S_1$  Possible under 2PL but  $S_2$  not.
- (C)  $S_2$  Possible under 2PL  $S_1$  not
- (D) None of these

### Indexing

**Q.72** A B-tree internal node has to be fit in memory block of size 512 bytes. Assuming key size as 8 bytes and record pointer size as 16 bytes and block pointer size as 12 bytes. The order of the tree is \_\_\_\_\_.

**Q.73** Consider a disk with block size 512 bytes suppose that a file has  $r = 30,000$  records, each of size 128 byte, what is the size of index file if we use un-spanned file organization with dense

indexing, assume that key of index is 16 byte and pointer of 7 byte.

- (A) 1348 blocks for index, file
- (B) 1364 blocks for index file
- (C) 340 blocks for index file
- (D) 336 blocks index file

**Q.74** Find the order of leaf node in a b+ tree. Let child pointer is 4 byte and record pointer is 8 byte and key field is 10 byte and Block size is 1204 byte

Note : Order of leaf node is max no of keys it can hold.

**Q.75** Consider a file consist of 10,000 records each of size 100 byte, each index contain 12 bytes key field and 8 byte pointers. File is ordered on the key field, so how many blocks required for dense index on this file \_\_\_\_\_.

NOTE: Block Size is 1000 byte.

**Q.76** The insertion of a record in a  $B^+$  tree will always cause the height of the tree to increase by one where

- (A) The tree consists of only a root node
- (B) The record is inserted into full leaf node
- (C) All the nodes in the path from the root to the desired leaf node are full before insertion
- (D) None of these

**Q.77** The order of a non-leaf node in a  $B^+$  tree is maximum number of keys it can hold if the block size is 1 kB, data record pointer is 8 byte the value field is 9 byte long and block pointer is 8 byte long what is the maximum order of Non-leaf node

- (A) 60
- (B) 59
- (C) 61
- (D) None of these



- Q.78** The order of a non – leaf node in a  $B^+$  tree is maximum number of block size is 1024 byte, data record pointer is 16 byte, the key field is to byte long and block pointer is 8 byte long, what is the minimum number of key a non-root non-leaf node can hold?
- (A) 56 (B) 28  
(C) 27 (D) 57
- Q.79** The difference between dense index and a sparse index is that
- (A) A dense index contains keys and pointer for each record where as a sparse index contains keys and for a subject of records.  
(B) A dense index contains keys and pointer for a subset of Record where as a sparse record  
(C) No. difference  
(D) A dense index can only be primary index and a sparse index can only be secondary index
- Q.80** For a  $B^+$  tree of order 201 consisting of 2 levels, the maximum number of leaf nodes would be if roof is at level zero
- (A) 603 (B) 40000  
(C) 40401 (D) None of these
- Q.81** The order of a non-leaf node in a  $B^+$  tree is maximum number of block pointer it can hold if the block size is 1024 byte, data record pointer is 16 byte, the value field is 18 byte long and block pointer is 8 byte long, what is the order of Non-leaf node
- (A) 22 (B) 41  
(C) 40 (D) None of these
- Q.82** Consider an unordered file of 100000 records with a record size at 100 byte stored a blocks of 2048 bytes with an unspanned record organization. We will assume that no system related information is stored within a block. On the average, how many blocks would have to be accessed to find a particular record?
- (A) 5000  
(B) 2500  
(C) 1250  
(D) None of these
- Q.83** Every department should have a manager and only one employee manages in a department and an manager can manage only one department, then participation of the employee is \_\_\_\_\_.
- Q.84** A database table publisher has 2000 records and occupies 100 disk block. Another table book has 5000 records and occupies 500 disk blocks. These two tables have to be joined as per nested loop join and publisher is in inside of book relationship then what is the cost of nested loop Join
- (A) 500500  
(B) 50100  
(C) 50500  
(D) 1000100
- Q.85** The given schedule is
- $S_1$ :  
 $R_2(z)R_2(y)W_2(y)R_3(y)R_3(z)R_1(x)W_1(x)$   
 $W_3(y)W_3(z)R_2(x)R_1(y)W_1(y)W_2(x)$
- $S_2$  :  
 $R_3(y)R_3(z)R_1(x)W_1(x)W_3(y)$   
 $W_3(z)R_2(z)R_1(y)W_1(y)$   
 $R_2(y)W_2(y)R_2(x)W_2(x)$
- Find which schedule is conflict serializable



- (A)  $S_1$  only
- (B)  $S_2$  only
- (C) Both
- (D) None of these

**Q.86** The relation R (A, B, C, D) is

$AB \rightarrow C$

$C \rightarrow D$

- (A) In 1 NF, but not in 2NF
- (B) In 2 NF, but not in 3NF
- (C) In 3 NF, but not in BCNF
- (D) In BCNF

**Q.87** Consider the following relation

Performance

ID	Subject	No. of classes
GA13	DS	80
GA13	TOC	60
GA22	C	70
GA23	DELD	80
GA22	Python	60
GA23	ALGORITIHM	50

Teacher

ID	Teacher_Name
GA13	Mr. Govind
GA22	Mr. Anish
GA23	Mr. Govind

Consider the following SQL query

Select T. Teacher\_Name, sum (P. No. of classes)

From Teacher T, Performance P

Where T. ID = P. ID

GROUP BY T. Teacher\_Name

The number of row that will be returned by the SQL query is

- (A) 3
- (B) 9
- (C) 18
- (D) 2



Answers		Database Management System							
1.	8	2.	24	3.	B	4.	3	5.	8
6.	96	7.	56	8.	104	9.	15	10.	A,C
11.	B	12.	A,B	13.	D	14.	A	15.	A
16.	A	17.	A,D	18.	A	19.	B	20.	A,B,C
21.	D	22.	3	23.	C	24.	A	25.	C,D
26.	D	27.	D	28.	A	29.	18	30.	6
31.	A,B,C,D	32.	10	33.	A,D	34.	C	35.	B
36.	3	37.	A	38.	B,C,D	39.	A	40.	5
41.	D	42.	3	43.	A,B,C,D	44.	A	45.	D
46.	22	47.	A,C	48.	B	49.	A	50.	C
51.	B	52.	A,B,C,D	53.	C	54.	C	55.	2
56.	A,B,C	57.	A,C,D	58.	B	59.	C	60.	A
61.	B	62.	A	63.	D	64.	C	65.	B
66.	D	67.	A	68.	C	69.	B,C,D	70.	B
71.	B	72.	13	73.	B	74.	56	75.	200
76.	C	77.	B	78.	B	79.	A	80.	C
81.	C	82.	B	83.	0	84.	A	85.	B
86.	B	87.	D						

Explanations		Database Management System							
1.	8	2.	24						
Minimal cover of given FD's is				R(A,B,C,D,E)					
A → E				A → B					
BE → D				B → C					
BDI → E				C → D					
F → A				D → E					
E → B				B → A					
BH → F				Candidate key's are A and B					
CD → A				(A) <sup>+</sup> = {A, B, C, D, E}					
Note AD → BE, AC → E are redundant functional Dependency, So they are not a part of Minimal cover.				(B) <sup>+</sup> = {A, B, C, D, E}					
The minimal set consist 8 FD's.				Total super key's are.					
Hence, the correct answer is 8.				Super key By (A) + Super key By (B) – Super key (AB)					
				⇒ $2^{n-1} + 2^{n-1} - 2^{n-2}$					

$$\Rightarrow 2^{5-1} + 2^{5-1} - 2^{5-2}$$

$$\{\because n = \text{no. of Attribute in Relation}\}$$

$$\Rightarrow 16 + 16 - 8$$

$$\Rightarrow 24$$

Hence, the correct answer is 24.

**3. (B)**

$X \rightarrow Y$  is non trivial if  $X \cap Y = \phi$  and  $X \rightarrow Y$  is semi trivial if

$$X \cap Y \neq \phi \text{ and } X \not\rightarrow Y$$

So,  $S_1$  is true but  $S_2$  is false

Hence, the correct option is (B).

**4. 3**

$$A \rightarrow B$$

$$BC \rightarrow E$$

$$ED \rightarrow A$$

Key's are

$$\{CDA\}^+ = \{A, B, C, D, E\}$$

$$\{CDB\}^+ = \{A, B, C, D, E\}$$

$$\{CDE\}^+ = \{A, B, C, D, E\}$$

3 Candidate keys are three

Hence, the correct answer is 3.

**5. 8**

Candidate key is AB

So, the number of super keys with two or more than two attributes

$= 2^{n-2}$  where n is the number of attributes in relation

$$\text{So, } = 2^{5-2} = 8$$

Hence, the correct answer is 8.

**6. 96**

No of super keys:-

Super keys (AB)+ Super keys (BE)- Super keys (ABE)

$$2^{8-2} + 2^{8-2} - 2^{8-3}$$

$$2^6 + 2^6 - 2^5$$

$$64 + 64 - 32 = 96$$

Hence, the correct answer is 96.

**7. 56**

No of super keys are:

$$\Rightarrow 2^{7-2} + 2^{7-2} - 2^{7-4}$$

$$= 2^5 + 2^5 - 2^3$$

$$= 32 + 32 - 8 \Rightarrow 64 - 8 \Rightarrow 56$$

Hence, the correct answer is 56.

**8. 104**

Number of super key (SK)  $\rightarrow$

$$SK(A) + SK(B) + SK(EF)$$

$$- SK(AB) - SK(BEF)$$

$$- SK(AEF) + SK(ABEF)$$

$$\Rightarrow 2^{7-1} + 2^{7-1} + 2^{7-2} - 2^{7-2} - 2^{7-3} - 2^{7-3} + 2^{7-4}$$

$$\Rightarrow 64 + 64 + 32 - 32 - 16 - 16 + 8$$

$$\Rightarrow 104$$

Hence, the correct answer is 104.

**9. 15**

Here  $\{A\}$ ,  $\{B\}$ ,  $\{C\}$ ,  $\{D\}$  are candidate keys then the super keys are

$\{A, AB, AC, AD, ABC, ABD, ABCD, B, BC, BD, BCD, C, CD, D\}$

i.e 15 Super keys are possible.

Hence, the correct answer is 15.

**10. (A,C)**

Insertion in to R and delete from S may cause inconsistency. But insertion into S will not cause any violation.

Hence, the correct option are (A,B).

**11. (B)**

$$\{A\}^+ = \{A, B, C, E\}$$

$$\{C\}^+ = \{C, E\}$$

$$\text{So } C^+ \subseteq A^+$$

Hence, the correct option is (B).

**12. (A,B)**

The value in A is any value except i because

$A \rightarrow D$  is FD

Hence, the correct option are (A,B).



13. (D)

$Q \rightarrow S$  and  $ST \rightarrow P$  is hold in given instance  
Hence, the correct option is (D).

14. (A)

$P \rightarrow Q$  and  $SQ \rightarrow R$  then  $PS \rightarrow R$  by P sides transitivity

Hence, the correct option is (A).

15. (A)

$\{BE\}^+ \Rightarrow \{B, D, E, A, C\}$  only BE is candidate key.

Hence, the correct option is (A).

16. (A)

F and G both generate same type of Functional dependency.

Hence, the correct option is (A).

17. (A, D)

For  $D_1$

	A	B	C	D
$R_1$	$\alpha$	$\alpha$	$\alpha$	
$R_2$		$\alpha$	$\alpha$	$\alpha$

Using FD No Modification is done so it is lossy.

For  $D_2$

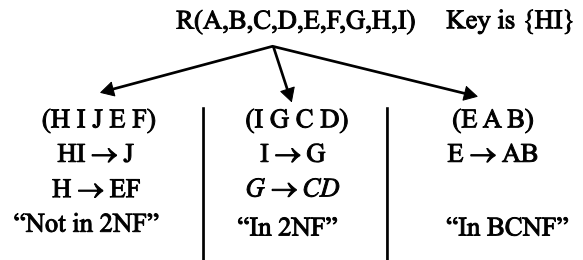
	A	B	C	D
$R_1$	$\alpha$	$\alpha$		
$R_2$		$\alpha$	$\alpha$	
$R_3$	$\alpha$	$\alpha$	$\alpha$	$\alpha$

Using  $R_1$  and  $R_2$   $A \rightarrow B$  we can put  $\alpha$  in ( $R_3B$ ) So last row contain all  $\alpha$ 's hence it is lossless join

So statement  $S_1$  and  $S_4$  is false.

Hence, the correct option are (A,D).

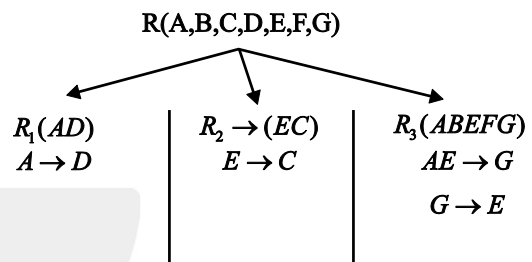
18. (A)



So, the decomposition is in 1 NF

Hence, the correct option is (A).

19. (B)



Here  $DF \rightarrow BC$  is Not preserve in Any of the above Relation So Not in 3NF. So it is 2NF

Hence, the correct option is (B).

20. (A,B,C)

Candidate key of Relation R is ABC and CDE  
So all attribute of Relation is Prime Attribute because part of ABC and CDE are A, B, C, D, E.  
Hence Relation is in 3NF is also in 2 NF and 1 NF

Hence, the correct option is (A,B,C).

21. (D)

Candidate key  $\{De\}^+ = \{D, C, A, B, E\}$  so  
 $D \rightarrow A$  and  $D \rightarrow B$  is PFD So relation is not in 2 NF.

Hence, the correct option is (D).

22. 3

FDs =  $\{A_1 \rightarrow A_2$

$A_2 \rightarrow A_3$

$A_1 A_3 \rightarrow A_4$

}  
 Candidate key is  $A_1A_5$

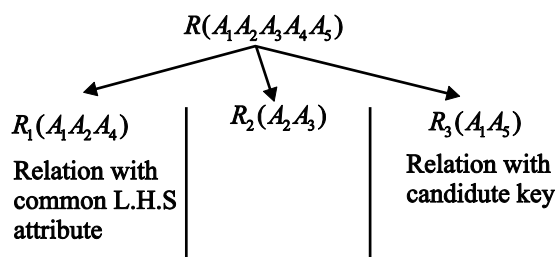
Minimal cover of given FD'S is

$$A_1 \rightarrow A_2$$

$$A_2 \rightarrow A_3$$

$$A_1 \rightarrow A_4$$

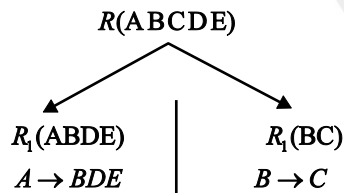
{Remove extra Attribute from L.H.S}



Total 3 Relation

Hence, the correct answer is 3.

23. (C)



In  $R_1$  'A' is Key and

In  $R_2$  'B' is Key So Both in BCNF

And

$$R_1 \cap R_2 \Rightarrow (ABDE) \cap (BC)$$

$$\Rightarrow B \text{ (key of } R_2 \text{ So lossless)}$$

$$\text{And } F.D'S(R_1) \cup F.D's(R_2)$$

$$\Rightarrow A \rightarrow BDE \cup B \rightarrow C$$

$$\Rightarrow \left\{ \begin{array}{l} A \rightarrow B \\ A \rightarrow D \\ A \rightarrow E \\ B \rightarrow C \\ A \rightarrow C \text{ (By transitive)} \\ A \rightarrow A \text{ (By reflexive)} \end{array} \right\} \Rightarrow \text{same as FD's (R)}$$

Hence, the correct option is (C).

24. (A)

$$\{AD\}^+ = \{A, B, C, D, E\}$$

$\therefore$  AD is candidate key for R.

So  $D \rightarrow B$  is a partial functional dependency

Hence R is in 1 NF

Hence, the correct option is (A).

25. (C,D)

(C) Weak Entity set is always total participation with strong set and relationship is identifying relationship.

(D) Two strong Entity set may be totally participate in Relationship.

Hence, the correct option is (C, D).

26. (D)

There is not any relation for relationship "R" because in one to many primary key of one side and attributes of relation is transfer to many side Hence, the correct option is (D).

27. (D)

$\{h, d\}$  is candidate key for A and any extra Attribute with  $\{h, d\}$  is super key. We can also design super key as a primary key for relation A.

Hence, the correct option is (D).

28. (A)

$\{c_1\}$  is key for Relation E.

$\{b_1, c_1\}$  is key for Relation B.

$\{a_1, b_1\}$  is key for Relation  $G_1$ .

$\{a_1, d_1\}$  is key for Relation A.

Hence, the correct option is (A).

29. 18

E is weak Entity set for F as well as G. So we can say that E is multivalued attribute for F as well as G. i.e there are two table for E as  $E_1$  (as multivalued Attribute of F) and  $E_2$  (as multivalued Attribute of G)

Hence,

$$E_1(b_1, c_1, c_2)$$

$$E_2(a_1, c_1, c_2)$$

$$F(b_1, b_2)$$

$$T_{b_3}(b_1, b_3)$$

$$G(a_1, a_2, a_3)$$

$$\text{So } x = 5 \text{ and } y = 13$$

$$x + y = 18$$

Hence, the correct answer is 18.

30. 6

Tables as follows

$$X(\underline{e}, f)$$

$$Y(\underline{d}, g, e)$$

$$Z(\underline{c}, i)$$

$$R_2(\underline{d}, c)$$

$$T_a(\underline{d}, a)$$

$$T_b(b, c)$$

Total 6 tables are there.

Hence, the correct answer is 6.

31. (A,B,C,D)

The cardinality ratio is one to many so one instructor can teach many courses and course is totally participate in the relation, So every course has a instructor.

Relation is one to many so. Attribute of Relationship added in many side table

Hence, the correct option are (A,B,C,D).

32. 10

Following table:-

$$E_2(b, e)$$

$$T_{E_1}(\underline{a}, b, d) \text{ as } E_2 \text{'s weak Entity}$$

$$T_{E_3}(\underline{c}, f)$$

$$T_{E_1}(\underline{a}, c, f) \text{ as } E_3 \text{'s weak Entity}$$

Total Attributes  $2+3+2+3 = 10$

Hence, the correct answer is 10.

33. (A,D)

In one to many relation primary key of one side entity is migrate to many side, so number of attributes in many side are more then one side.

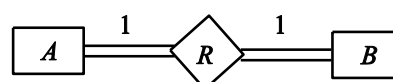
Hence, the correct option is (A,D).

34. (C)

We can't connect two Relationship directly.

Hence, the correct option is (C).

35. (B)



If one – one Relation and Both

Entity total participate in Relation then merge table of AB and make single table.

Hence, the correct option is (B).

36. 3

Given, 3 relation R,S,T

Result of  $\pi_{A,C}(R \bowtie S)$  is

A	C
1	3
1	5
2	4
3	3
3	5
4	3
4	5
5	6

Result

$\pi_{A,C}(T)$	
A	C
1	3
3	3
4	5
4	3
5	6

A	C
1	5
2	4
3	5

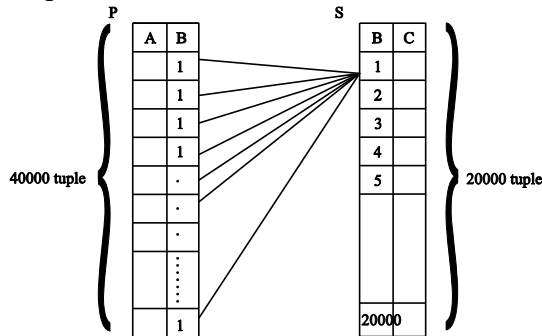
So Answer is 3

Hence, the correct answer is 3.

37. (A)

B is key on S that contain 20000 tuple. So maximum 40000 tuples of table P can be match to table S through attribute B

Example



Hence, the correct option is (A).

38. (B,C,D)

Total 15 tuples in  $P \times Q$  than after satisfying condition the Resultant table is

A	B	B	C	D
2	P	P	8	9
8	r	r	9	10
5	t	t	6	7

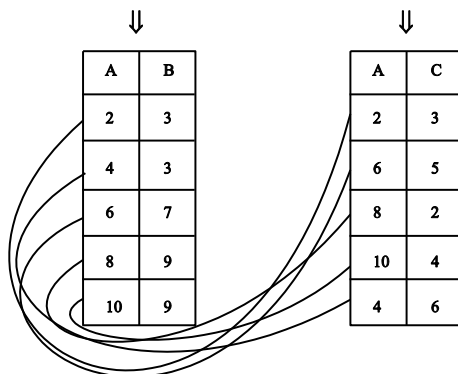
Hence, the correct option are (B,C,D).

39. (A)

The result of Natural Join is zero because key, So, result of both set are different. Hence, the correct option is (A).

40. 5

$$\pi_{A,B}(P * Q) * \pi_{A,C}(Q * R)$$



A	B	C
2	3	3
6	7	5
8	9	2
4	3	6
10	9	4

So the total number of tuples in the Result is 5. Hence, the correct answer is 5.

41. (D)

$\pi_{x,y,z}(R) - \pi_{xyz}(S)$  given uncommon tuple of Relation R

$\pi_{x,y,z}(S) - \pi_{xyz}(R)$  given uncommon values of set (x,y,z) from S so

X	Y	Z
4	2	3
1	2	6

So total 3 tuples.

Hence, the correct option is (D).

42. 3

$S_1, S_2, S_5$  are unsafe Query

Hence, the correct answer is 3.

43. (A,B,C,D)

All are Equivalent Output of all are Same.

Hence, the correct option are (A,B,C,D).

44. (A)

Given the name of department that do not have any girl student.

Hence, the correct option is (A).

45. (D)

The output of All Overs are same

They perform equal join operation.

Hence, the correct option is (D).

46. 22

A		B		C		D		
E1	1×	B1	2×	C1	3×	D1	2	⇒12
		C1		C2		D2		
				C3				
E2	1	B2	×1	C1	×2	D1	2	⇒4
				C2		D3		
E3	1	B1	×2	C4	1×	D1	2	⇒4
		B2		×		D4		
E4	1×	B5	1×	C1	1×	D1	2	⇒2
						D3		
								22

Hence, the correct answer is 22.

47. (A,C)

R		R	
P	Q	P	Q
T <sub>1</sub>	a	T <sub>1</sub>	a <sub>1</sub>
T <sub>2</sub>	a	T <sub>2</sub>	a <sub>2</sub>

Hence, the correct option is (A,C).

48. (B)

P		d		R	
x	a	a	c	b	c
1	2	2	2	1	2
2	3	3	3	2	3

Delete from P Cause deletion from Q also now deleting from Q also now deleting Q(c) put null in R(c)

So resultant R will be

R	
b	c
1	Null
2	Null

Hence, the correct option is (B).

49. (A)

Here A is primary key so count of A is same as count of record in R.

Hence, the correct option is (A).

50. (C)

2 and 3 statements are not going to execute. So total sum of salaries are.

$$200000+400000+150000 = 750000$$

Hence, the correct option is (C).

51. (B)

Natural Join produce the matched, row of both table

But left outer Join produce both matched as well as unmatched row of left table

So query Q2 contain the result of Q2 as well as the unmatched row of relation A

Hence, the correct option is (B).

52. (A,B,C,D)

- (A) Insertion in Q cause error. Q(a) refer P(a) and 30 is not in P(a).
- (B) Insertion in R cause error because R(c) refer Q(c) 30 is not in Q(c).
- (C) P is base table for Q so deleting the value will cause referential integrity error.
- (D) Q is base table for R. So Deletion given Error have.

Hence, the correct option are (A,B,C,D).

53. (C)

P	A	B	Q	B	C
	b	c		c	f
	b	d		e	i
	d	e		c	g
	c	f		b	e
	b	k		b	f

P.A = Q.B then

P.A	P.B	Q.B	Q.C
b	c	b	e
b	c	b	f
b	d	b	e
b	d	c	f
c	f	c	f
c	f	c	g
b	k	b	e
b	k	b	f

O/P  $\Rightarrow$

P.A	C-count
b	6
c	2

Hence, the correct option is (C).

54. (C)

Given SQL print all the name of student's, that contain single P and S in their name.

Hence, the correct option is (C).

55. 2

The give SQL is implementation of division operation of Relational Algebra ( $R \div S$ ). So it find the value of A corresponding to all value of B is S.

So,

A
1
2

Is o/p

The number of tuple return is 2

Hence, the correct answer is 2.

56. (A,B,C)

Employee		
Eno	Ename	Dno
1	A	10
2	B	20
3	C	30

Project	
Pno	Pname
101	x
102	y

Work-on	
Eno	Pno
1	101
1	102
2	102
3	103

So according to question we need to find the name of employee who work on all project means. Work on 101 and 102. i.e Eno 1.

(a)

$T_1$	$T_2$
Pno	Eno
101	1
102	

Result

Ename
A

(b) If inner correlated sub Query gives false result i.e null then outer Query given O/p.

So only for Eno = 1 it gives o/p hence

Ename
A

(c) We can also implement division of RA using option (C)

A,B,C are Equivalent

Hence, the correct option is (A,B,C).

57. (A,C,D)

In Option (A) Eno is 3 and in option (D) Eno is 2 Both Entries already present in table and Eno is Primary key So both cause error and in option (C) Ename is null but the is constraint Ename Can't null So it cause Error.

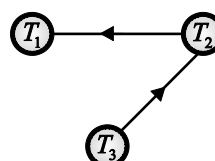
Hence, the correct option is (A,C,D).

58. (B)

We cannot select any column with aggregate function directly, for these we must use group by So, option B is illegal.

Hence, the correct option is (B).

59. (C)



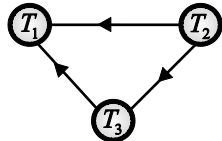
If we apply Topological sort then order of execution  $T_3, T_2, T_1$

Hence, the correct option is (C).

60. (A)

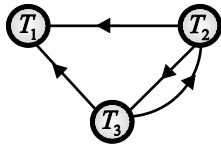
Only  $S_1$  is conflict serializable. The precedence graph of  $S_1$  and  $S_2$  is

$S_1$ :



Not any cycle so conflict serializable

$S_2$ :



Cycle in graph so not conflict serializable

Hence, the correct option is (A).

61. (B)

$T_1^{(10)}$	$T_2^{(20)}$
$r(x)$	$r(y)$
$w(y)$	$w(x)$

Initially Read and write Time stamp as  $x$  is 10 and Read and write the stamp of  $y$  is 20

So,  $r_1(x)$  and  $r_2(y)$  Execute but  $w_1(y)$  fail because Time of  $T_1 = 10$  and write T.S of  $y$   $TS(T_1) < \text{Write-T.S}(y)$

Hence, the correct option is (A).

62. (A)

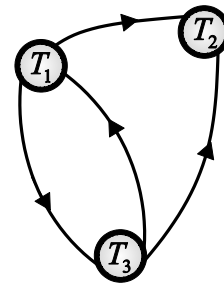
Error file : only tell as what went wrong. It is not useful for recovery.

Log file:- It is used for recovery.

Hence, the correct option is (A).

63. (D)

$T_1$	$T_2$	$T_3$
$W(A)$		
	$R(A)$	
	$W(A)$	
$W(B)$		
		$R(B)$
		$W(B)$
	$W(B)$	
$R(B)$		



Graph contain cycle So not conflict Serialzable  
Now,

There does Not Exist any serial schedule which is view equivalent to  $S$ . It is not view serializable

Hence, the correct option is (D).

64. (C)

$T_1$	$T_2$	$T_3$
$r(x)$		
$w(x)$	$r(y)$	
		$r(y)$
		$r(z)$
	$w(y)$	
		$w(x)$

If we consider  $TS(T_1) = 1000$ ;  $TS(T_2) = 3000$  and  $TS(T_3) = 2000$  then all Transactions successfully execute without abort

$T_1 = 1000$	$T_2 = 3000$	$T_3 = 2000$
r(x) read – TS(x)=1000		
	r(y) read- TS(y)=3000	
w(z) write – TS (z)=1000		r(y) read – TS(y)=3000 r(z) read TS(z)=2000
	w(y) write TS-(Y) = 3000	
		w(x) write – TS (x) = 2000

NOTE :-

Read operation of “item” by Transaction  $T_i$  is perform successfully if

$$TS(T_i) \geq \text{Write-TS}(\text{item})$$

And read – TS (item) = max (read – TS (item), TS ( $T_i$ ))

$T_i$  is perform successfully if  
{

$$T_s(T_i) \geq \text{read – TS (item)}$$

$$\text{And } T_s(T_i) \geq \text{write – TS (item)}$$

}

And

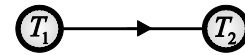
$$\text{Write – TS (item) = TS (Ti)}$$

Hence, the correct option is (C).

65. (B)

S	
$T_1$	$T_2$
R(A)	
W(A)	
	R(A)
R(B)	
	W(A)
W(B)	
C;	
	R(B)
	W(B)
	C;

$S_1$  : Precedence graph



No cycle Hence it is conflict serializable

$S_2$  :  $T_2$  dependry on  $T_1$  and commit of  $T_1$  before  $T_2$  So it is recoverable.

$S_3$  :  $T_2$  reads uncommitted date of  $T_1$ . Hence pt is no cascadless schedule.

Hence, the correct option is (B).

66. (D)

All transactions are committed So none transaction is in undo list undo list is Empty.

Hence, the correct option is (D).

67. (A)

Both  $T_1$  and  $T_2$  reads and modify it. The net effect of  $T_1$  and  $T_2$  should be change on A. Only  $T_2$ 's change is seen, however, the final value of A has increased by 50, causing lost update done by  $T_1$ .

Hence, the correct option is (C).

68. (C)

Both  $S_1$  and  $S_2$  are true

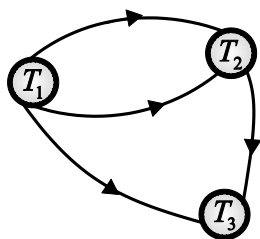
Hence, the correct option is (C).

69. (B,C,D)

S		
$T_1$	$T_2$	$T_3$
R(A)		
	W(A)	
W(A)		
		W(A)
$C_1$		
	$C_2$	
		$C_3$



There No update Read So it is recoverable as well as cascade less.



Graph Contain cycle So Not Conflict Serializable

S			S		
T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
R(A)			R(A)		
	W(A)		W(A)		
W(A)			C <sub>1</sub>	W(A)	
		W(A)		C <sub>2</sub>	
C <sub>1</sub>					W(A)
	C <sub>2</sub>				C <sub>3</sub>
		C <sub>3</sub>			

S is view equivalent to its serial schedule (S<sub>1</sub>).

Hence it is view serializable.

Hence, the correct option are (B,C,D).

70. (B)

S <sub>1</sub>	
T <sub>1</sub>	T <sub>2</sub>
R(X)	
	W(X)
	Commit
R(X)	

↑  
Unrepeatable  
read

S <sub>2</sub>	
T <sub>1</sub>	T <sub>2</sub>
W(X)	
	R(X)
Rollback	

↑  
Dirty  
read

Hence, the correct option is (B).

71. (B)

Apply lock on S<sub>1</sub>

S <sub>1</sub>	
T <sub>1</sub>	T <sub>2</sub>
S(X)	X(Y)
R(X)	S(X)
	W(Y)
	R(X)
X(Y)	Unlock(Y)
W(Y)	Unlock(X)
Commit	
Unlock(X)	Commit
Unlock (Y)	

So,

S<sub>1</sub> Possible in 2PL

Apply lock on S<sub>2</sub>

S <sub>2</sub>			
T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
S(X)			
R(X)	X(Y)		
	R(Y)		
X(Z)			
W(Z)		S(Y)	← Can't Apply because exclusive Apply by T <sub>2</sub>
Commit		R(Y)	
	W(Y)	R(Z)	
		W(X)	
	Commit		
		Commit	

S<sub>2</sub> Not Possible Under 2PL

Hence, the correct option is (B).

72. 13

Each block consist  $(n - 1)$  keys,  $(n - 1)$  record pointer and  $n$  child pointer

Where  $n$  is order of B tree.

$$(n-1) \times 8 + (n-1) \times 16 + n \times 12 \leq 512$$

$$36n - 24 \leq 512$$

$$36n \leq 512 - 24$$

$$n \leq 13.55$$

$$\text{So } n = 13$$

Hence, the correct answer is 13.

73. (B)

In case of dense indexing

Total number of index = No. of recodes in a file  
 $= 30,000$

No. of Index in one block

$$= \frac{\text{Block size}}{\text{index size}} = \frac{512 \text{ byte}}{23 \text{ byte}}$$

$$= 22.26$$

$$\approx 22 \text{ (for unspanned)}$$

$$\begin{aligned} \text{No. of Block for index file} &= \frac{\text{Total index}}{\text{index in one block}} \\ &= \frac{30,000}{22} \end{aligned}$$

$$= 1363.63 \approx 1364 \text{ blocks}$$

Hence, the correct option is (B).

74. 56

In  $B^+$  tree leaf node

$(n-1) \rightarrow$  key pointer

$(n-1) \rightarrow$  record pointer

$1 \rightarrow$  child pointer

$$\text{So, } (n-1) \times 10 + (n-1) \times 8 + 1 \times 4 \leq 1024$$

$$18n \leq 1024 + 14$$

$$n \leq 57.66$$

$$n = 57$$

$$\text{So, } n - 1 = 56$$

Order of leaf node is 56

Hence, the correct answer is 56.

75. 200

Size of index = 1248 = 20 byte

Size of block = 1000 byte

$$\text{No. of index in one block} = \frac{\text{Block size}}{\text{index size}}$$

No. of index for dense index = No. of record's in file = 10000

So,

$$\begin{aligned} \text{No. of Block for index file} &= \frac{\text{No. of index}}{\text{index in one block}} \\ &= \frac{10,000}{50} = 200 \end{aligned}$$

Hence, the correct answer is 200.

76. (C)

77. (B)

Assume Maximum number of keys node can hold is  $n$  then  $(n+1)$  child pointer and 0 record pointer for non leaf node

$$\text{So } n \times 9 + (n+1) \times 8 \leq 1024$$

$$n \approx 59$$

Hence, the correct option is (B).

78. (B)

If  $n$  is order of  $B^+$  tree then max  $n$  child pointer  $(n-1)$  key and 0 Record pointer |for non-leaf node|

$$\text{So, } n \times 8 + (n-1) \times 10 \leq 1024$$

$$18n \leq 1034$$

$$n \leq 57.44$$

$$n \approx 57$$

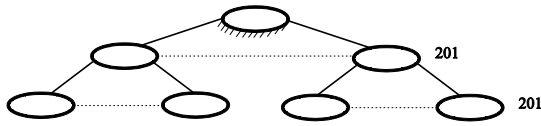
$$\text{Minimum key } \frac{n-1}{2} \Rightarrow \frac{57-1}{2}$$

$$\frac{56}{2} = 28$$

Hence, the correct option is (B).

79. (A)

80. (C)



Then maximum leaf node  $201 \times 201 = 40401$   
Hence, the correct option is (C).

81. (C)

Non-leaf node of  $B^+$  tree contain max (n) child pointer (block pointer) (n-1) keys. 0 record pointer

$$n * 8 + (n-1) * 18 \leq 1024$$

$$26n \leq 1024 + 18$$

$$n = 40.0768$$

$$n \cong 40$$

Hence, the correct option is (C).

82. (B)

According un-spanned file organization an block of size 2048 can contain 20 Record of 100 byte

So, for storing 100,000 record we required

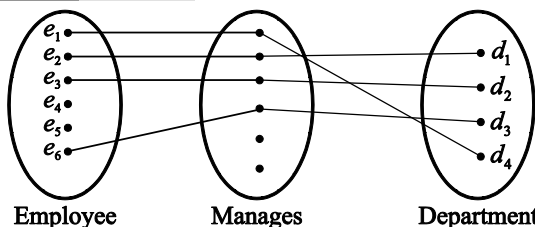
$$\Rightarrow \frac{100,000}{20} \Rightarrow 5000 \text{ blocks.}$$

So, for accessing a data we required an average Half of block

$$\text{So, } \frac{5000}{2} \Rightarrow 2500$$

Hence, the correct option is (B).

83. 0



Participation or minimum number of relationship in employee is = 0

Because there can be many employees who cannot manager.

84. (A)

$$\text{Cost of nested loop join} = b_R + n_R * b_S$$

Where  $b_R \rightarrow$  blocks for outer relation

$n_R \rightarrow$  number of tuples for outer relation

$b_S \rightarrow$  number of blocks for inner relation.

$n_S =$  number of tuples for inner relation

And here book is an outer relation

$$\text{So, } n_R = 5000$$

$$b_r = 500$$

$$n_S = 2000$$

$$b_S = 100$$

$$\begin{aligned} \text{So cost} &= 500 + 5000 * 100 \\ &= 500 + 500000 \end{aligned}$$

$$\text{Cost} = 500500$$

Option A is the correct option

85. (B)

$S_1$

Find number of nodes = 3

Conflict operations are

$$R_2(z)W_3(z), R_2(y)W_3(y),$$

$$R_2(y)W_1(y), W_2(y)R_3(y),$$

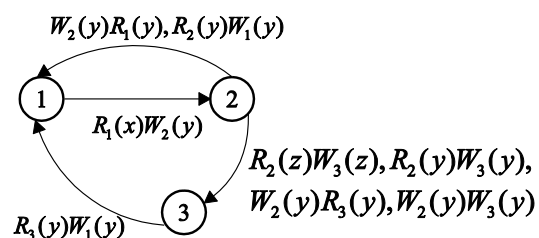
$$W_2(y)W_3(y), W_2(y)R_1(y), R_3(y)$$

$$W_1(y), R_1(x)W_2(x)$$

$$W_1(x)R_2(x), W_1(x)W_2(x),$$

$$W_3(y)R_1(y), W_3(y)W_1(y)$$

Draw the graph



In the point 2 we get a cycle so it is not conflict serializable

$S_2$

no. of nodes = 3

Conflict operations are

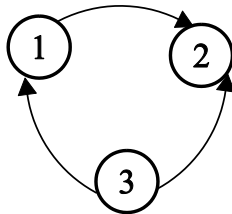
$R_3(y)W_1(y), R_3(y)W_2(y), R_1(x)W_2(x), W_1(x)R_2(x),$   
 $W_1(x)W_2(x),$

$W_3(y)R_1(y), W_3(y)W_1(y), W_3(y)R_2(y), W_3(y)W_2(y),$   
 $W_3(z)R_2(z),$

$R_1(y)W_2(y), W_1(y)R_2(y), W_1(y)W_2(y)$

Draw the graph

Teacher_Name	No. of Classes
Mr. Govind	270
Mr. Anish	130



In this precedence graph there is no cycle so,  $S_2$  is conflict serializable so option B is correct

**86. (B)**

First we find its candidate key

$AB^+ = \{A, B, C, D\}$

So, AB is a candidate key

(1) First we check for BCNF [For BCNF

$A \rightarrow B$   
 $\downarrow$

A must be super key

$AB \rightarrow C$  [AB is super key]

$C \rightarrow D$  (C is not a super key)

So it is not in BCNF

(2) Now we check for 3NF [ $X \rightarrow a$ ]

[X is either super key or A is prime attribute]

$AB \rightarrow C$  (true because AB is a super key)

$C \rightarrow D$  (False because C is not a super key or D is not a prime attribute)

(3) Now we check for 2NF [ $X \rightarrow a$  is not in 2NF if X is proper subset of some candidate key and a is non prime or non key attribute]

$AB \rightarrow C$  [False because AB is not proper subset & C is a non prime attribute]

$C \rightarrow D$  [False because C is not proper subset and D is non prime attribute]

So it is in 2NF so option B is correct

**87. (D)**

When we perform GROUP BY T.Teacher\_name, then if more than one ID have same name then we write only one time so out final table is

So only 2 rows are returned in the table

