Q.1) Max Marks: 1

Consider two schedules:
S1: R1(y), R1(x), W2(y), R2(x), R3(x), W1(y), C1, C2, W3(x), C3
S2: R2(x), R1(x), W1(x), W2(x), W2(y), R3(x), W3(x), R3(y), C1, C3, C2
Which of the schedules is cascadeless?

A **Only S1** Correct Option

Solution: (A)
Solution: (i)
S2 is non recoverable because T3 reads x after T2 writes but T3 commits before T2.

B **Only S2**

C **Both S1 and S2**

D **None of them**

Q.2) Max Marks: 1

Consider STUDENT table with following tuples.

Name	CPI
A	8.5
B	9.5
C	8.2
D	9.7
E	8.5
F	8.3

```
(SELECT *
FROM STUDENT S1
WHERE 3 >= (SELECT COUNT(*)
            FROM STUDENT S2
            WHERE S1. CPI < = S2.CPI))
UNION
(SELECT *
FROM STUDENT S1
WHERE S1.CPI > ALL ( SELECT CPI
                     FROM STUDENT S2
                     WHERE 5 > = (SELECT COUNT (*)
                                  FROM STUDENT S3
                                  WHERE S2.CPI < = S3. CPI )) )
```

How much number of tuples are there in the output of the above query?

Correct Answer

Solution: (2)
Solution: 2
There are two queries:
Query 1: Select students who have not more than 3 students with CPI > = theirs.
Query 2: Select students who have CPI > ALL (sub-query). Similar to Query 1, sub-query selects students who have not more than 5 students with CPI > = theirs.
Here, Query 1 outputs B and D and sub-query outputs A, B, D, E. So, Query 2 outputs empty as none have CPI greater than B (not even himself)
So, result = 2 rows UNION Empty set, therefore there is no intersection. Hence, the answer is 2.

Q.3) Max Marks: 1

What is the smallest number of keys that will force a B-Tree of order 3 to have a height of 3?

Correct Answer

Solution: (15)

Solution: 15

Since, order = 3

Therefore, minimum keys at root, internal node or leaf = 1

And, node pointers = 2

For height = 3, the number of levels will be = 4

So, number of keys at level 0 is = 1 // root node

Number of keys at level 1 is = 2

Number of keys at level 2 = 4

Number of keys at level 3 = 8

Therefore, total keys = 8 + 4 + 2 + 1 = 15

Q.4) Max Marks: 1

Given the Schedule S, which of the following is True?
R1(y), R1(x), W2(y), R2(x), R3(x), W1(y), C1, C2, W3(x), C3

A **S is not recoverable**

B **S is recoverable but not cascadeless.**

C **S is strict**

D **S is cascadeless but not strict** Correct Option

Solution: (D)
Solution: (iv)
T2 reads x from T1 which is not yet written, same for T1. So it does not make any difference T1, T2 and T3 reads x which is no yet amended. Therefore, it is recoverable and cascadeless but not strict because T2 has written the value of y before commit.

Q.5) Max Marks: 1

Which of the following statement is true for the given schedule?
S: R1(X), R2(Z), R3(X), R3(Y), W1(X), W3(Y), R2(Y), R2(X), W2(X), W2(Z), C1, C2, C3;

A **Schedule S is both conflict serializable and recoverable schedule.**

B **Schedule S is neither conflict serializable nor recoverable schedule.**

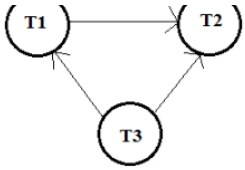
C **Schedule S is not conflict serializable but recoverable schedule.**

D **Schedule S is conflict serializable and irrecoverable schedule.** Correct Option

Solution: (D)
Solution: (iv)
Consider the given transaction :

T1	T2	T3
R(X)		
	R(Z)	
		R(X)
		R(Y)
W(X)		
		W(Y)
	R(Y)	
	R(X)	
	W(X)	
	W(Z)	
C1		
	C2	
		C3

The precedence graph of the above schedule will be:



Since the graph is acyclic, therefore, the given schedule is conflict serializable schedule. But it is non recoverable/irrecoverable due to uncommitted read R2(Y) in T2. Since, T2 depends on T3 so, for S to be recoverable C2 should happen after C3. But since C2 is before C3, therefore, S is not recoverable.

Q.6) Max Marks: 1

Suppose the search field is V = 9 bytes long, the disk block size is B = 512 bytes, a record pointer Pr is 7 bytes, and a block pointer Pb is of 6 bytes. Each B-tree node can have at most p tree pointers, p – 1 data pointers and p – 1 search key field values. These must fit into a single disk block if each B-tree node is corresponds to a disk block. What is the value chosen for p which satisfies above given inequality.

Correct Answer

Solution: (24)

Solution: 24

The inequality formed here will be:

$\Rightarrow 6 * n + (n - 1)(9 + 7) \leq 512$

$\Rightarrow 6n + 16n - 16 \leq 512$

$\Rightarrow 22n \leq 528$

$\Rightarrow n = 24$

Q.7) Max Marks: 1

The physical location of a record determined by a formula that transforms a file key into a record location is

A **Hashed file** — Correct Option

Solution: (A)
Solution: (i)
Except hash, we do not use any formula to determine the physical location of records.

B **B-Tree file**

C **Indexed file**

D **Sequential file**

Q.8) Max Marks: 1

Consider the relation Marks

Student_Roll_no	DBMS_Marks	OS_Marks
1	45	NULL
2	NULL	90
3	100	80

Select Student_Roll_no From Marks
Where ((DBMS_Marks > OS_Marks) AND OS_Marks > 75
AND (DBMS_Marks > 90) OR (DBMS_Marks < 50);

Which student's tuples are returned?

A **2 and 3 only**

B **1 only**

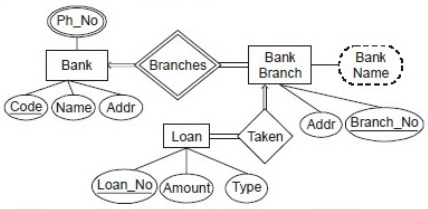
C **1 and 3 only** — Correct Option

Solution: (C)
Solution: (iii)

D **1, 2 and 3**

Q.9) Max Marks: 1

Consider the following E-R diagram



What is the number of tables present in minimized ER model?

Correct Answer

Solution: (3)

Solution: 3

Since "Loans" is on many side, therefore we will merge loan with the "taken" relationship.

Further "Bank Branch" can be merged in above since although it is in "one" side of the relationship, but it is in total participation in the relationship "taken" , so we can merge and hence resultant table will be now "loan - taken – bank branch"

Now "branches" relationship can also be merged since this is a weak relationship and "bank branch" is a weak entity, so now we have "branches – bank branch - taken - loan" under one relation.

Now since "bank" is a strong entity this cannot be merged in the above relation. 2 tables are compulsory for weak - strong entity pair as far as RDBMS design is concerned. So we require separate table for entity "bank"

Finally, "Ph_No" is a multivalued attribute , so requires separate table

Hence, minimum no of tables required = 3

Q.10) Max Marks: 1

Which of the following statement is False?

A **Division is not a basic relation algebra operator.**

B **Number of tuples in left outer join of relation r and s is strictly greater than number of tuples in full outer join of r and s.** Correct Option

Solution: (B)

Solution: (ii)

Number of tuples in left outer join includes all the tuples of left relation where as full outer join includes all the tuples from both the relation. In this case, let |r| and |s| be the number of tuples in relation R and S respectively, then the number of tuples in r left outer join s will be |r|, whereas number of tuples in r full outer join s will eb at least max |r|, |s| and atmost |r| + |s|.

C **Cartesian product changes the schema whereas set difference doesn't.**

D **In 3 valued logic, unknown OR true is true.**

Q.11) Max Marks: 1

Consider the following relations:

T1:

T1X	T1Y
x	1
y	2
z	3

T2:

T2X	T2Y	T2Z
x	1	11
y	2	NULL

For the given query, what is the number of rows will be there in the output?

Select *

From T1

Where Not Exists (Select T2Y From T2 Where T2Y <> T1Y)

Where Not Exists (Select T2Y From T2 Where T2Y <> T1Y)

A 1

B 2

C 3

D 0 Correct Option

Solution: (D)

Solution: (iv)

The inner query is returning column T2Y of all the tuples from the table formed by cross product T1 X T2 where columns T1Y and T2Y are not equal.

Table T1 has 3 tuples and T2 has 2 tuples so T1 X T2 will have 2 * 3 = 6 tuples.

In these 6 tuples, values of attributes (T1U, T2Y) will be: (1, 1), (1, 2), (2, 1), (2, 2), (3, 1), (3, 2). Out of these 6 pairs, 4 of them are not having equal (T1Y, T2Y) value. Since, the sub-query will return 4 tuples, the NOT EXISTS construct will return the false for each of the 3 tuples in T1. So, 0 tuples will be there in output.

Q.12) Max Marks: 1

Consider a relation R(A, B, C,D). For which of the following sets of Functional Dependencies of R is in BCNF?

A A -> C, B -> A, A -> D, AD -> C

B A -> D, C -> A, D -> B, AC -> B

C ABC -> D, BCD -> A, D -> C, ACD -> B

D BD -> C, AB -> D, AC -> B, BD -> A Correct Option

Solution: (D)
Solution: (iv)
For each given FD, the closure of the left-side attributes in ABCD. Thus, the left-side attributes of each FD contain a key, and the relation is in BCNF.

Q.13) Max Marks: 1

Consider the following FD's in the Database.

A -> B
B -> C
D -> E
E -> D
F -> G
F -> H

The relatrion R(A, B, D, E) is in:

A In 2NF but not in 3NF

B In 3NF but not in BCNF

C In BCNF

D None of the above Correct Option

Solution: (D)
Solution: (iv)
The relation R consists FD's : A -> B, D -> E, E -> D. These all are partial dependencies therefore, it is not even in 2NF. Hence the correct option is (iv)

Q.14) Max Marks: 1

Which of the following is true about view serializable schedule?

I. Blind writes appear in every view-serializable schedule that is not conflict serializable.
II. Every view serializable schedule is recoverable.

A Only I Correct Option

Solution: (A)
Solution: (i)
Statement II is false because they are independent.

B Only II

C Both I and II

D None of the above

Q.15) Max Marks: 1

If an E-R model says E having at least one multi-valued attribute is converted into relational model say R then what will be the number of simple candidate key possible in R if E has only single attribute as candidate key?

A 0

B **Exactly 1** Correct Option

Solution: (B)
Solution: (ii)
At least one multivalued attribute implies that there will be at least two relations in relational model.
Candidate key for relations having multivalued attribute will be => Candidate key of E + multivalued attribute itself. On assuming that E has only single attributes as candidate key then relational model will have only one simple candidate key.

C More than 1

D Can't say

Q.16) Max Marks: 2

For the given definition and details of B-tree and B+-tree, which of the following is true?

"For order P, root node will have keys between 1 to 2P and for other nodes keys will be in between P to 2P."
If,
Disk block size, B = 2048 bytes,
Block pointer, P_b = 30 bytes,
Record pointer, P_r = 25 bytes, and
Search Key, P_k = 20 bytes

I. On considering leaf nodes, the difference between order of B-tree and order of B+-tree is 9
II. On considering non-leaf nodes, the difference between order of B-tree and order of B+ tree is -7

A Only I

B **Only II** Correct Option

Solution: (B)

Solution: (ii)

The definition of order given in the question is based on number of keys. Since, order will be based on maximum occupancy which is given as 2P keys.

Order for B-tree:

$\Rightarrow P_b * (2P) + (P_k + P_r) * (2P - 1) \leq B$
$\Rightarrow 30 * 2P + (20 + 25) * (2P - 1) \leq 2048$
$\Rightarrow 60P + 90P - 45 \leq 2048$
$\Rightarrow 150P \leq 2048 + 45$
$\Rightarrow P = 2093/150 = 13.9 = 13$

Order for non- leaf node of B+ tree:

$\Rightarrow P_b * (2P) + P_k * (2P - 1) \leq B$
$\Rightarrow 30 * 2P + 20 * (2P - 1) \leq 2048$
$\Rightarrow 60P + 40P - 20 \leq 2048$
$\Rightarrow 100P \leq 2068$
$\Rightarrow P = 2068/100 = 20.68 = 20$

Order of leaf node of B+ tree:

$\Rightarrow P_b * 1 + (P_k + P_r) * 2P \leq B$
$\Rightarrow 30 * 1 + (20 + 25) * 2P \leq 2048$
$\Rightarrow 90P \leq 2048 - 30$
$\Rightarrow P = 2018/90 = 22.4 = 22$

Therefore, the difference between order of B-tree and B+ tree on considering leaf nodes is = 13 – 22 = -9

The difference between the order of B-tree and B+ tree on considering non-leaf nodes is = 13 – 20 = -7

Hence, only statement II is correct

Hence, only statement II is correct.

C Both I and II

D None of the above

Q.17) Max Marks: 2

Consider the following schedule with the transaction time stamp for T1, T2, T3 as 1, 2, and 3 respectively.
S: R1(A), R2(B), W1(C), R3(B), R3(C), W2(B), W3(A);
Which of the following options are correct for the above transaction?

A S is allowed under Timestamp ordering protocol but not under Thomas write rule.

B S is allowed under both Timestamp ordering protocol as well as under Thomar write rule.

C S is neither allowed under Timestamp ordering protocol nor under Thomas write rule. Correct Option

Solution: (C)

Solution: (iii)

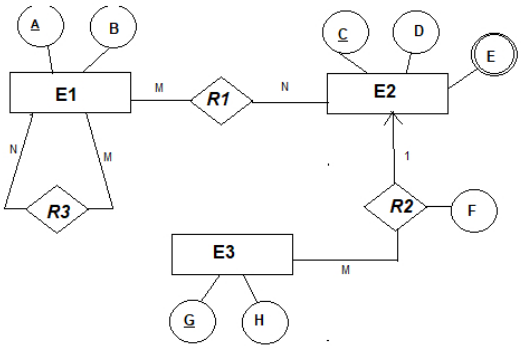
Here, T1 should happen before T3 due to W1(C) -> R3(C) (i.e T1 -> T3).

T3 should happen before T2 due to R3(B) -> W2(B) (i.e T3 -> T2) but according to the given time stamp, T2 is scheduled before T3. Hence, it will roll back. Therefore, this schedule is not allowed under TSP. Since it is R-W conflict, therefore, it is not even allowed under TWR.

D S is not allowed under Timestamp ordering protocol but is allowed under Thomas write rule.

Q.18) Max Marks: 2

Consider the given E-R diagram:



The minimum number of foreign keys in the relational model of above E-R diagram is _____

Correct Answer

Solution: (5)
Solution: 5
Total 5 foreign keys will be there in the relational model of above E-R diagram. Based on the following analysis:
(i) The self referential relationship R3 will result in formation of 2 separate relation due to many-to-many relationship. Hence, attribute A will refer to itself. Therefore, # of foreign keys = 1.
(ii) The relation between E1 and E2 is many-to-many + partial participation on both sides. Hence, relation for R1 will contain primary key of both E1 and E2 as foreign key in R1. Therefore, # of foreign keys = 3.
(iii) Entity E2 consist of a multivalued attribute E, therefore, E will form separate relation and will contain primary key of E2 as its foreign key. Therefore, # of foreign key = 4
(iv) Entity E2 and E3 have one-to-many relation (R2). Hence, primary key of E2 will be foreign key in E3. Therefore, # of foreign key = 5
Hence, the total number of foreign keys = 5.

Q.19) Max Marks: 2

Given relations R and S. Function C denotes number of results in the output.

Which of the following statements **can be** correct?

I. $C(R \bowtie S) > C(R \rhd\lhd S)$
II. $C(R \rhd\lhd S) > C(R \bowtie S)$
III. $C(R \bowtie S) > C(R \bowtie S)$
IV. $C(R \rhd\lhd S) > C(R \bowtie S)$

A I and II

B II and III

C Only III

D III and IV Correct Option

Solution: (D)
Solution: (iv)
Left and right outer joins can yield result set of sizes both greater or smaller than each other depending on the data. Full outer join will always have a set size greater than (or equal to) the result of left or right joins.

Q.20) Max Marks: 2

Consider the two statements given below:

I. A relation R(ABC) with FD set F = {A -> B, B -> C, C -> A} is decomposed into R1 and R2 such that R1 ∩ R2 = empty set. Then the decomposition of R is in 3 NF but not in BCNF.

II. There is always a decomposition into BCNF which is lossless and dependency preserving.

Which of the above statement/s are not correct.

A Only I

B Only II

C Both I and II Correct Option

Solution: (C)

I. Whatever combination of decomposition R1 and R2 we take, it will always follow the 3NF conditions i.e either LHS should be a superkey or RHS should be a prime attribute for the given FD's candidate keys are= {A, B, C}. Therefore, it is in 3NF as well as in BCNF. Therefore, this statement is false.

II. It is false because decomposition in BCNF is always lossless but we cannot say anything about dependency preserving. The FD's may or may not get preserved.

D Neither I not II

close