EPT-TEST-32(DBMS)
Total Questions: 25
Time: 60 minutes

Q1. How many super keys are possible in relation to R (A_1, A_2, … A_6) if candidate keys are {A_1, A_2}? (NAT Type)

Q2. Consider a relation R with the attributes (P, Q, M, S, T, U, V, W) with the following functional dependencies :P → Q, S → V, TU → W, MS → T, Q → U, U → S, S → P, T → M. Which of the following is/are keys for relation R? (MSQ)

A) MS
B) STU
C) PS
D) PU

Q3. Consider the following relations:

Employee

Emp_id	Emp_name
101	Amit
102	Rohan
103	Somya

Performance

Emp_id	Project_code	Rating
101	PA	10
102	PB	9
103	PB	10
102	PA	8
103	PC	5

The SQL query is given below

SELECT E.Emp_name, SUM(P.rating) FROM Employee E, Performance P WHERE E.Emp_id = P. Emp_id GROUP BY E. Emp_name;

The number of tuples returned by the SQL query is _____ (NAT Type)

Q4. Consider the relation students with Roll no. as the key

Students

Rollno	Marks
1	92
2	93
3	94
4	NULL

The following SQL query is successfully executed on the relation student.

SELECT avg(Marks) FROM student;

The output of the above query is:

A) 93
B) 93.5
C) 94
D) NULL

Q5. Consider the following given relations.

Restaurant

Rest_id	Rest_name	Rest_city
101	Madhulikam	Bangalore
121	Lazzez	Mumbai
114	Sagar Ratna	Delhi
120	Food Plaza	Bangalore
180	Tandoor Palace	Kolkata
135	Foodie	Chennai

Food_item

Food_id	Food_name	Rest_id
22	Sweets	101
24	Dosa-Idli	114
15	Veg Roll	120
18	Biryani	180
20	Pizza	121
14	Burger	121
10	Paneer Roll	120

Consider the SQL query specified below:

SELECT * FROM Restaurant R LEFT OUTER JOIN Food_item F ON R.Rest_id= F. Rest_id;

What will be the number of tuples returned by the given query? (NAT Type)

Q6. Strict 2PL protocol guarantees:

- **A) Recoverable schedule**
- **B) Cascadeless schedule**
- **C) Strict schedule**
- **D) All of the above**

Q7. Consider a file of size 2 MB, having 2K fixed-length Blocks. Following are the records which need to be stored in the blocks: R1(500B), R2(800B), R3(300B) R4(1000B), R5(500B). If the spanned organization of records is used. What is the total number of Blocks required to store all the records?

- **A) 5 blocks**
- **B) 4 blocks**
- **C) 6 blocks**
- **D) 3 blocks**

Q8. Consider an ordered file that contains 30,000 records. These records are stored on a disk. The Size of a block is 1024 bytes. The length of file records is 100 bytes and records cannot be spanned. A primary index structure is employed that contains 9 bytes key and 6 bytes block pointer. Assume that the mean number of block accesses needed without indexing is x and with indexing is y. Then the value of x+y?

- **A) 17**
- **B) 18**

C) 19
D) 20

Q9. Consider a B-tree with given data: Size of search key value = 10 bytes, block size of 512 bytes, block pointer is of 5 bytes, and the data pointer is of 8 bytes. What will be the order of the B-tree? (NAT Type)

Q10. What is the difference between maximum and minimum number of keys in the B-tree of order 23 for internal nodes?

A) 10
B) 11
C) 12
D) 13

Q11. Consider the data given below for the B+ Tree:

i)Size of the Search key field is 9 bytes long

ii)Size of block = 512 bytes

iii)Size of record pointer = 7 bytes

iv)Size of block pointer = 6 bytes

What will be the order of the leaf node and internal node respectively?

A) 31 and 33
B) 32 and 34
C) 31 and 34
D) 32 and 33

Q12. Which of the following is TRUE?

A) Every relation in 3NF is also in BCNF
B) A relation R is in 3NF if every non-prime attribute of R is fully functionally dependent on every key of R
C) Every relation in BCNF is also in 3NF
D) No relation can be in both BCNF and 3NF

Q13. Which is not a feature of DBMS?

A) Data Redundancy
B) Independence
C) Flexibility
D) Data Integrity

Q14. The ability to query information from the database, insert, delete, and modify the tuples is___

A) Data definition language (DDL)
B) Data manipulation language (DML)
C) Storage definition language (SDL)
D) Relational schema

Q15. Consider a schema R(A, B, C, D) and the following functional dependencies.

$A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow B$

Then decomposition of R into R_1 (A, B), R2(B, C) and R3(B, D) is____

A) Dependency preserving and lossless join.
B) Lossless join but not dependency preserving.
C) Dependency preserving but not lossless join.
D) Not dependency preserving and not lossless join.

Q16. Which of the following schedules is not conflict serializable?

A) 2RA, 2WA, 3RC, 2WB, 3WA, 3WC, 1RA, 1RB, 1WA, 1WB
B) 3RC, 2RA, 2WA, 2WB, 3WA, 1RA, 1RB, 1WA, 1WB, 3WC
C) 2RA, 3RC, 3WA, 2WA, 2WB, 3WC, 1RA, 1RB, 1WA, 1WB
D) 2RX, 3WX, 3Commit, 1WY, 1Commit, 2RY, 2WZ, 2Commit

Q17. DBMS is the collection of_____ that enables a user to create and maintain a database.

A) Keys
B) Transactions
C) Objects
D) Programs

Q18. Which is the data model?

A) Relational
B) Object-Oriented
C) Network
D) All of the above

Q19. In a relational data model, which one of the following statements is TRUE?

A) A relation with only two attributes is always in BCNF.
B) If all attributes of a relation are prime attributes, then the relation is in BCNF.
C) Every relation has at least one non-prime attribute.
D) BCNF decompositions preserve functional dependencies.

Q20. Consider the relational database with the following four schemas and their respective instances. Student(sNo, sName, dNo) , Dept(dNo, dName), Course(cNo, cName, dNo), Register(sNo, cNo)

Student		
sNo	sName	dNo
S01	James	D01
S02	Rocky	D01
S03	Jackson	D02
S04	Jane	D01
S05	Milli	D02

Dept	
dNo	dName
D01	CSE
D02	EEE

	Course	
cNo	cName	dNo
C11	DS	D01
C12	OS	D01
C21	DE	D02
C22	PT	D02
C23	CV	D03

Register	
sNo	cNo
S01	C11
S01	C12
S02	C11
S03	C21
S03	C22
S03	C 23
S04	C11
S04	C12
S05	C11
S05	C21

SQL Query:

SELECT * FROM Student AS S WHERE NOT EXIST (SELECT cNo FROM Course WHERE dNo = "D01" EXCEPT SELECT cNo FROM Register WHERE sNo = S.sNo)

The number of rows returned by the above SQL query is_____. (NAT Type)

Q21. Consider the following locking protocol:

(i) Transaction must lock all data items before begins any read and write operation.

(ii) Transaction executes all read and write operations until transaction commit/rollback.

(iii) Transaction unlocks all data items.

Which of the following is true above the given protocol?

A) Guaranteed no deadlock and guaranteed strict recoverability may not serializable
B) Guaranteed no deadlock and no starvation
C) Guaranteed no deadlock and guaranteed serializability and strict recoverability
D) Guaranteed serializable and no deadlocks may not strictly recoverable

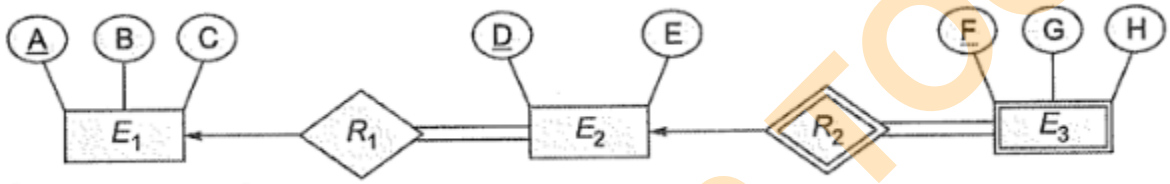
Q22. F and Gare two FDs sets

F:	G:
P→Q	P→R
R→P	R→Q
PQ→ R	QR → P

Which of the following is correct?

A) Fcovers G but G does not cover F
B) G cover F but F does not cover G
C) F covers G and G covers F
D) None of these

Q23. Find the minimum number of Tables for a given entity relationship diagram.



(NAT Type)

Q24. Which one of the options given below refers to the degree (or arity) of a relation in relational database systems?

A) Number of attributes of its relation schema.
B) Number of tuples stored in the relation.
C) Number of entries in the relation.
D) Number of distinct domains of its relation schema.

Q25. Consider the relation: Project (pno, pname, budget, city)

Query1: SELECT pname FROM Project WHERE NOT (budget <= ANY (SELECT budget FROM Project WHERE city = "KANPUR"))

computes:

A) Name of the projects whose budgets is less than at least one project in KANPUR
B) Name of the projects whose budgets is greater than some project in KANPUR

C) Name of the projects whose budgets is less than all project in KANPUR

D) Name of the projects whose budgets is greater than all project in KANPUR

ANSWERS

A1. (48)

•Taking A_1 as a candidate key.

(others have two choices: take or don't take). Number of super keys = 2^{n-1} ,say A_1

•Taking A_2 as a candidate key.

Number of super keys = 2^{n-1}, say A_2

Using inclusion-exclusion principle

$(|A_1| \cup |A_2|) = |A_1| + |A_2| + (|A_1| \cap |A_2|) = 2^{n-1} + 2^{n-1} - 2^{n-2} = 2^6 - 2^{6-2} = 64-16=48$

A2. A, B

Explanation: MS → T, S → V, S → P, P → Q, Q → U, TU → W.

A) (MS)+ = {P, Q, M, S, T, U, V, W}

∴ MS is a key for R.

B) (STU)+ = {S, T, U, V, W, P, M, Q}

∴ STU is a key for R.

C) (PS)+ = {P, S, Q, V, U}

∴ PS is not a key for R.

D) (PU)+ = {P, U, Q, S, V}

∴ PU is not a key for R.

A3. (3)

Explanation: GROUP BY E. Emp_name means all employee names that are the same should be kept in one row. Here, there are 3 employee names, and all are distinct. So, no need to execute the query, and we can tell the number of tuples returned = 3.

OR

Step 1: Perform cross product between Employee E and performance P, we will get 15 rows-relation.

Step 2: Execute WHERE clause; WHERE E. Emp_id = P. Emp_id

Delete rows which do not satisfy WHERE condition.

Step 3: Execute GROUP BY clause: GROUP BY E. Emp_name and then SELECT clause.

Output:

E. Emp_name	**SUM(P.rating)**
Amit	**10**
Rohan	**17**
Somya	**15**

A4. (A)

A5. (8)

The above SQL query returns 8 tuples.

The resultant relation is

Restaurant

Rest_id	Rest_name	Rest_city
101	Madhulikam	Bangalore
121	Lazzez	Mumbai
114	Sagar Ratna	Delhi
120	Food Plaza	Bangalore
180	Tandoor Palace	Kolkata
135	Foodie	Chennai

Food_item

Food_id	Food_name	Rest_id
22	Sweets	101
24	Dosa-Idli	114
15	Veg Roll	120
18	Biryani	180
20	Pizza	121
14	Burger	121
10	Paneer Roll	120

A6. (D)

A7. (B)

In a spanned organization records are allowed to span in more than one Block.

Block size= File size/Number of Blocks in File

= $2x2^{20}B / 2x2^{10}$

=1KB

500+800+300+1000+500 = 3100 bytes

So, number of blocks required = ⌈3100 bytes/1024 bytes⌉

= ⌈ 3.02 ⌉

= 4

Hence, 4 Blocks are required to store all the records.

A8. (C)

Given, the size of the block = 1024 bytes

Size of each record = 100 bytes

Number of records per block = 1024/100=10.24

Since records are stored in unspanned manner, we can store only 10 records at maximum.

The number of blocks required to store 30000 records = 30000/10=3000

Without primary index number of block accesses = ⌈log2 3000⌉=12

Size of an index record = 9 bytes + 6 bytes = 15 bytes

Number of index records per block = 1024/15=68

As we got the number of blocks that is required to store all these records are= 3000

So, the total number of index records = 3000

∵ 68 index records are present in 1 block.

3000 index records will be present in 3000/68 = 45 block.

With primary index total number of block accesses=⌈log2 45⌉+1=6+1=7

So x+y=12+7=19

A9. (23)

Let n be the order of the B-tree

k represents the key size

p_r represents the record pointer

p_b represents the block pointer

BS represents block size

A/Q, Given: k = 10 bytes, BS = 512 bytes, p_r = 8 bytes, p_b = 5 bytes.

$n \times p_b + (n - 1) \times (k + p_r) \leq$ Block size

$\Rightarrow n \times 5 + (n - 1) \times (10 + 8) \leq 512$

$\Rightarrow 5n + 18n - 18 \leq 512$

$\Rightarrow 23n - 18 \leq 512$

$\Rightarrow n \leq 530/23$

$n \leq 23.04$

$\therefore n = 23$

Thus, the order of B-tree = n = 23.

A10. (B)

For internal nodes,

Minimum number of keys = $\lceil p/2 \rceil - 1 = \lceil 23/2 \rceil - 1 = 11$

Maximum number of keys = p – 1 = 23 – 1 = 22

A11.(C)

For internal node:

As we know, an internal node of the B+ tree has pointers = P and search key value =(P-1)

Thus,P * (block pointer) + (P – 1) * (key field) ≤ Block Size

$\Rightarrow P * (P_b) + (P - 1)(V) \leq$ block size

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

$\Rightarrow 15\ P \leq 521$

$\Rightarrow P = 34$

$\Rightarrow O_{non-leaf}$=Order of non-leaf (internal node) P=34

Structure of Leaf node

(K1, Pr1) (K2, Pr2) ..... (Km, Prm) Pb

$P_{leaf} (K + Pr) + P_b \leq$ Block size

Where K = search key field

Pr = record pointer

Pb = block pointer

$\Rightarrow P_{leaf} (9 + 7) + 6 \leq 512$

$\Rightarrow P_{leaf} * 16 \leq 512$

$\Rightarrow P_{leaf} \leq 50616$

Pleaf =order of leaf=31

A12. (C)

BCNF is a stronger version of 3NF. So every relation in BCNF will also be in 3NF

A13. (A)

A14. (B)

A15. (B)

A16. (C)

A17. (D)

A18. (D)

A19. (A)
A20. (2)
A21. (C)
A22. (C)
A23. (3)
A24. (A)
A25. (D)