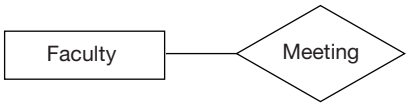
DATABASE TEST 1

Number of Questions: 35 **Section Marks: 30**

Directions for questions 1 to 35: Select the correct alternative from the given choices.

Questions 1 to 15 carry one mark each:

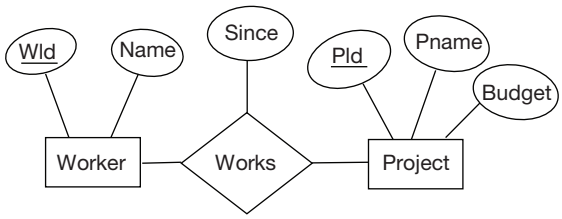
1. Consider the given ER-Diagram



The given ER-Diagram represents

(A) Unary Relationship (B) Binary Relationship
(C) Ternary Relationship (D) None of the above

2. Consider the given ER-Diagram:



Which of the following is the descriptive Attribute?

(A) WId (B) Since
(C) PId (D) {WId, PId}

3. Which of the following statements is FALSE about "Weak Entity"?

(A) A weak entity can be identified uniquely only by considering some of its attributes in conjunction with the primary key of another Entity.
(B) The owner entity set and the Weak entity set must participate in a one-to-many relationship set.
(C) One owner entity is associated with one or more weak entities, but each weak entity has a single owner.
(D) The weak entity set may/may not have total participation in the identifying relationship set.

4. Consider the given Relation schema:

Student (RNo: integer, sname: string, login: string, age: integer, grade: char(1), parent-name: string, percentage: Real).

What is the "Arity" of given Relation schema?

(A) 2, 3, 1, 1 (B) 7
(C) 3, 4 (D) 6

5. Which of the following specifies "Cardinality" of a Relation?

(A) The number of fields in a Relation
(B) The number of columns in a Relation
(C) The number of Tuples in a Relation
(D) Both (A) and (C)

6. Consider the following table:

Sailor

Sname	Rating	Age
Yashu	9	35
Lalit	10	45
Yashu	9	40
Bose	8	41

How many tuples are returned by following expression, $\pi_{\text{Sname, Rating}}$ (Sailor)

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

7. Which of the following statement is FALSE, for 2 Relations R and S?

(A) RXS returns a Relation with all the fields of R in the same order as they appear in R followed by all the fields of S in the same order as they appear in S.
(B) The fields in RXS have the same domains as the corresponding fields in R and S.
(C) $R \cap S = R - (R - S)$
(D) $R \cap S = S - (S - R)$

8. Which of the following correctly describes "Prime Attribute"?

(A) It should be a part of primary key
(B) It should be a part of any candidate key
(C) It should be a part of every candidate key
(D) None of the above.

9. Let X, Y and Z denote sets of attributes over a relation schema R. Match the following.

I. If $X \rightarrow Y$, then $XZ \rightarrow YZ$ for any Z
II. If $X \supseteq Y$, then $X \rightarrow Y$
III. If $X \rightarrow YZ$, then $X \rightarrow Y$ and $X \rightarrow Z$
P. Reflexivity
Q. Augmentation
R. Decomposition

(A) I–Q, II–P, III–R (B) I–P, II–R, III–Q
(C) I–P, II–Q, III–R (D) I–R, II–Q, III–P

10. Which of the following are additional features of SQL?

(A) SQL has language constructs for specifying views, also known as virtual tables, using the CREATE VIEW Statement
(B) SQL and Relational databases can interact with new technologies such as XML and OLAP.
(C) SQL has Language constructs for creating triggers
(D) All the above

11. Consider the given Functional Dependencies for Employee – Project Relation:

ENo → EName
PNo → PName, Location

{ENo, PNo} → Hours
How many attributes appear in the closure of ENo, (ENo^+)?
(A) 1 (B) 2
(C) 3 (D) 5

12. Magnetic tapes are sequential access devices, to access the n^{th} block on tape _____?
(A) We must scan over the preceding $(n-1)$ blocks
(B) We can scan directly n^{th} block
(C) We must scan atleast $\frac{n}{2}$ blocks before scanning n^{th} block
(D) We must scan atmost $\frac{n}{2}$ blocks before scanning n^{th} block

13. What is the unused space in each block, for fixed length record of size 'R' bytes with $B \geq R$ (B = Block Size), we can fit $\lfloor B/R \rfloor$ ($bfr = \lfloor B/R \rfloor$) records in one block?
(A) $B - (bfr * R)$ (B) $(B - bfr * R) + 1$
(C) $B + (bfr * R)$ (D) $\frac{B}{bfr} + R$

14. To utilize the unused space in each block, we can store part of a record on one block and the rest on another, A pointer at the end of the first block points to the block containing the remaining part of record, what this organization is called?
(A) Unspanned (B) Spanned
(C) Distributed (D) Collabarative

15. For variable length records using spanned organization, each block may store different number of records. The blocking factor "bfr" represents the average number of records per block for the file, what is the number of blocks 'b' needed for a file of 'r' records?
(A) $b = \left\lceil \frac{bfr}{r} \right\rceil$ (B) $b = \left\lceil \frac{r}{bfr} \right\rceil$
(C) $b = \lceil r \times bfr \rceil$ (D) $b = \left\lceil \frac{2 \times r}{bfr} \right\rceil$

16. Which of the following SQL Query is valid to increment the age of the student whose student Id (Sid) is 63078?
(A) Update student S
SET S.age = S.age + 1;
WHERE S.Sid = 63078
(B) Select S.age + 1
From student S
Where S.Sid = 63078
(C) Update S.age = S.age + 1
WHERE S.Sid = 63078
(D) Both (A) and (B)

17. Consider the given Relation worker
Worker

WId	Name	Service	Age

To Rename table as Employee or WId as EId, service as Experience, which of the following is not valid?
(A) $\rho_{Employee}$ worker
(B) $\rho_{(EID, Experience)}$ worker
(C) $\rho_{(EID, Name, Experience, Age)}$ worker
(D) $\rho_{Employee\ (EID, Name, Experience, Age)}$ worker

18. Consider the given schema for sailors
sailors(Sid : integer, Sname : string, Rating : integer, age : real).
Which of the following SQL Queries is invalid?
(A) SELECT S.Rating, (S.age)
FROM Sailors S
WHERE S.Rating = 10
(B) SELECT S.Rating, MAX (S.age)
FROM Sailors S
GROUPBY S.Rating
(C) SELECT S.Sname, MAX (S.age)
FROM Sailors S
WHERE S.Rating > 7
(D) SELECT AVG (S.Age)
FROM Sailors S
WHERE S.Rating > 8

19. Consider the schema given in the above Question,
SELECT Sname
FROM Sailors
WHERE Rating IN(6, 8, 9, 10)
What is retrieved by the above query?
(A) The names of sailors whose Rating is between 6 and 10.
(B) The names of sailors whose Rating is any one of 6, 8, 9, 10.
(C) Both (A) and (B)
(D) None of the above

20. Let 'R' be a Relation schema and Let x and y be non empty sets of attributes in R. An instance 'r' of R satisfies the FD $-x \rightarrow y$. For which of the following tuples t_1 and t_2 are in r?
(A) $t_1 \cdot x = t_2 \cdot x$ and $t_1 \cdot y = t_2 \cdot y$
(B) $t_1 \cdot x = t_2 \cdot y$ and $t_1 \cdot y = t_2 \cdot y$
(C) $t_1 \cdot x = t_2 \cdot x$ and $t_1 \cdot y = t_2 \cdot x$
(D) $t_1 \cdot x = t_2 \cdot y$ and $t_1 \cdot x = t_2 \cdot y$

21. Consider the following Relational instance?

A	B	C	D
a_1	b_1	c_1	d_1
a_1	b_1	c_1	d_2
a_3	b_2	c_3	d_1
a_2	b_3	c_2	d_4

Which of the following are satisfied by the given instance?
(A) $AB \rightarrow C$ (B) $AB \rightarrow CD$
(C) $AC \rightarrow D$ (D) $D \rightarrow AC$

22. Consider the given Relation R

R

W	X	Z
W_1	X_1	Z_1
W_2	X_2	Z_2
W_3	X_2	Z_1

$\pi_{wx}(R)\ x\ \pi_{xz}(R)$, what is the number of tuples returned by the given expression?

(A) 2 (B) 3
(C) 4 (D) 5

23. For the Relation 'R' given in the above question, if we perform $\pi_{wx}(R) \bowtie \pi_{xz}(R)$ ($\bowtie$: left outer join), what is the number of tuples that appear in the Result?

(A) 0 (B) 3
(C) 5 (D) 6

24. Consider the given SQL Query:
Select DISTINCT ENo
From works
Where (PNo, Hours) IN (Select PNo, Hours
From works where ENo = '788');
What is returned by the above query?

(A) The employee numbers of all employees who work on the same (PNo, Hours) combination on some project on which Employee ENo 788 is working.
(B) The employee numbers of all employees who work on the same (PNo, Hours) combination whose ENo is 788.
(C) Both (A) and (B)
(D) None of the above

25. Retrieve the Employee numbers (ENo) of all employees who work on project numbers 11, 22, 23, 24?

(A) SELECT ENo
FROM Works
Where PNo IN(11, 22, 23, 24)
(B) Select DISTINCT ENo
From Works
Where PNo IN(11, 22, 23, 24)
(C) Select ENo
FROM Works
Where PNo = 11 AND PNo = 22 AND PNo = 23 AND PNo = 24.
(D) Select *
FROM works
Where PNo = 11 OR PNo = 22 OR PNo = 23 OR PNo = 24.

26. Which of the following correctly specifies the "JOIN" Operation on 2 tables Employee and Department, the common field in both tables is DNo?

(A) Select *
From (Employee JOIN Department ON Employee.DNo = Department.DNo)
(B) Select *
From (Employee JOIN Department)
(C) Select *
From Employee, Department
(D) Select *
From (Employee JOIN Department IN Employee. DNo = Department.DNo)

27. Consider the given Functional Dependencies for Employee – project Relation
ENo → EName
PNo → PName, Location
{ENo, PNo} → Hours
How many attributes are included in the closure of $\{ENo, PNo\}^+$?

(A) 2 (B) 4
(C) 5 (D) 6

Common data for Questions 28 and 29:
Consider the 2 tables T_1 and T_2

Table T_1

P	Q	R
20	X	50
25	Y	80
35	X	60

Table T_2

A	B	C
20	Y	60
35	Z	30
20	Y	50

28. What is the number of tuples returned from
$T_1 \bowtie (T_1 \cdot P = T_2 \cdot A \text{ AND } T_1 \cdot R = T_2 \cdot C) T_2$?

(A) 0 (B) 1
(C) 2 (D) 3

29. What is the number of tuples returned from
$T_1 \bowtie (T_1 \cdot P = T_2 \cdot A \text{ OR } T_1 \cdot R = T_2 \cdot C)\ T_2$?

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

Common data for Questions 30 and 31:
Consider the given Relation worker:

Name	Age	Project-Number
Anu	26	10
Bala	24	20
Sudhir	28	10
Shreya	24	10
Bharat	19	20
Srinath	21	30
Raj	22	30
Mishra	21	20
Phani	19	40

30. What is the Result of the following SQL Query SELECT Project-Number, MIN (Age)

FROM Worker
GROUPBY Project-Number
HAVING COUNT (*) ≥ 3

(A)

Project-Number	MIN (Age)
10	24
20	19

(B)

Project-Number	MIN (Age)
10	24
20	19
30	21
40	19

(C)

Project-Number	MIN (Age)
10	24
20	19
30	21

(D)

Project-Number	MIN (Age)
20	19
40	19

31. In the Result of following SQL query
SELECT Age, count (*)
FROM Worker
GROUPBY Age
What is the number of tuples?
(A) 4 (B) 5
(C) 6 (D) 9

Common data for Questions 32 and 33:
Consider the given 2 tables:
Sailor-1:

Sname	Rating	Age
Yashu	9	35
Lalit	10	45
Bose	8	41
Ana	7	40

Sailor-2

Sname	Rating	Age
Raj	10	40
Kamal	10	41
Ana	7	40

32. Which of the following Tuple is not part of sailor-1 and sailor-2?
(A)

Yashu	9	35	Kamal	10	41

(B)

Lalit	10	45	Raj	10	40

(C)

Ana	7	40	Kamal	7	40

(D)

Bose	8	41	Lalit	10	45

33. What is the number of tuples appear in sailor-1 SET DIFFERENCE sailor-2?
(A) 0 (B) 1
(C) 2 (D) 3

Common Data for Questions 34 and 35:
Consider the given 2 tables Employee and Department and primary keys are shown with underline.

Employee

Eld	Name	DNo	Age
0326	Kumar	5	38
0429	Nilesh	4	36
0589	Phani	4	34
0679	Raja	3	36
0588	Deepak	2	37

Department

DNo	DName
1	Accounts
2	Sales
3	Marketing
4	Executives
5	Research

34. Insert into Employee values < 0589, 'Anurag', 3, 37 >, The above operation violates which constraint?
(A) NOT NULL Constraint
(B) KEY Constraint
(C) Entity Integrity Constraint
(D) Referential Integrity Constraint

35. Delete Department tuple with DNo = 5, The above operation violates which constraint?
(A) NOT NULL Constraint
(B) KEY Constraint
(C) Referential Integrity Constraint
(D) Entity Integrity Constraint

Answer Keys

1. A	**2.** B	**3.** D	**4.** B	**5.** C	**6.** B	**7.** D	**8.** B	**9.** A	**10.** D
11. B	**12.** A	**13.** A	**14.** B	**15.** B	**16.** D	**17.** B	**18.** C	**19.** B	**20.** A
21. A	**22.** D	**23.** C	**24.** A	**25.** B	**26.** A	**27.** D	**28.** B	**29.** D	**30.** A
31. C	**32.** D	**33.** D	**34.** B	**35.** C					

Hints and Explanations

1. If only one entity is participating in a relationship that relation is called Unary Relation. Choice (A)

2. Descriptive attributes are used to record information about the relationship, rather than about any one of the participating entities. Suppose we wish to record that a particular worker is working for a project since 1993; This information is captured by adding an attribute "since" to works. Choice (B)

3. The weak entity set must have total participation in the identifying relationship set. Choice (D)

4. The degree is also called "Arity" of a relation, is the number of fields (or) columns, There are '7' fields. Choice (B)

5. The "cardinality" of a relation instance is the number of tuples in it. The degree of the relation is the number of fields (or) columns. Choice (C)

6. π-project, eliminates duplicates

Sname	Rating
Yashu	9
Lalit	10
Bose	8

∴ Hence '3' tuples. Choice (B)

7. $R \cup S = S - (S - R)$ is not TRUE. Choice (D)

8. Prime Attributes should be part of any candidate key. Choice (B)

9. Choice (A)

10. All the statements are additional features of SQL. Choice (D)

11. $ENo^{+} = \{ENo, EName\}$. Choice (B)

12. We must scan over the preceding $(n - 1)$ blocks. Choice (A)

13. $B - (bfr * R)$ is the unused space in each block. Choice (A)

14. It is called spanned organization. Choice (B)

15. $b = \left\lceil \left(\frac{r}{bfr} \right) \right\rceil$ Choice (B)

16. We can modify the column values in an existing row using the UPDATE command. We can increment the age of the student with Sid 63078

```
UPDATE Student S
SET S.age = S.age + 1
WHERE S.Sid = 63078
```

(or)

```
Select S.age + 1
From Student S
Where S.Sid = 63078.
```

Choice (D)

17. $\rho_{(EID, Experience)}$ worker
It will replace WID with EID and Name with Experience which is NOT Valid. Choice (B)

18. If select clause uses an aggregate operation, then it must only use aggregate unless the query contains a GROUP BY clause. Choice (C)

19. It retrieves the names of sailors whose Rating is any one of the given Ratings 6, 8, 9, 10.
Choice (B)

20. $t_1 \cdot x = t_2 \cdot x$ and $t_1 \cdot y = t_2 \cdot y$. Choice (A)

21. The given instance satisfies $AB \rightarrow C$.
Choice (A)

22. $\pi_{wx}(R)$

W	X
W_1	X_1
W_2	X_2
W_3	X_2

$\pi_{XZ}(R)$

X	Z
X_1	Z_1
X_2	Z_2
X_2	Z_1

$\pi_{wx}(R)$ $(\rhd\lhd)$ $\pi_{xz}(R)$

W	X	Z
W_1	X_1	Z_1
W_2	X_2	Z_2
W_2	X_2	Z_1
W_3	X_2	Z_2
W_3	X_2	Z_1

Choice (D)

23. All tuples in $\pi_{wx}(R)$ has atleast one matching in $\pi_{xz}(R)$, so same number of tuples as $\pi_{wx} \rhd\lhd \pi_{xz}(R)$, returned in the result. Choice (C)

24. The employee numbers of all employees who work on the same (PNO, Hours) combination on some project on which employee ENO 788 is working. Choice (A)

25. Some employees may work on more than one project, so DISTINCT Key word will eliminate duplicates in the output. Choice (B)

26. The concept of Joining Relations was incorporated into SQL to permit users to specify a table resulting from a Join operation in the FROM clause of a query.
Choice (A)

27. $\{ENo, PNo\}^{+} = \{ENo, PNo, EName, PName, Location, Hours\}$. Choice (D)

28. $T_1 \bowtie T_2$

P	Q	R	A	B	C
20	X	50	20	Y	60
20	X	50	35	Z	30
20	X	50	20	Y	50
25	Y	80	20	Y	60
25	Y	80	35	Z	30
25	Y	80	20	Y	50
35	X	60	20	Y	60
35	X	60	35	Z	30
35	X	60	20	Y	50

Only 1(3rd tuple). Choice (B)

29. Refer the table given in the above solution.
$T_1 \cdot P = T_2 \cdot A$
1st, 3rd, 8th tuples
$T_1 \cdot R = T_2 \cdot C$
7th tuple
$\therefore$ Total '4' tuples. Choice (D)

30. GROUP-BY Project-Number gives

Table-1

Name	Age	Project-Number
Anu	26	10
Sudhir	28	10
Shreya	24	10

Table-2

Name	Age	Project-Number
Bala	24	20
Bharat	19	20
Mishra	21	20

Table-3

Name	Age	Project-Number
Srinath	21	30
Raj	22	30

Table-4

Name	Age	Project-Number
Phani	19	40

Table-1 and Table-2 are satisfying the condition count (*) ≥ 3. Choice (A)

31. GROUP-BY Age returns

Anu	26

Sudhir	28

Bala	24
Shreya	24

Bharat	19
Phani	19

Srinath	21
Mishra	21

Raj	21

Result:

Age	Count (*)
19	2
21	2
22	1
24	2
26	1
28	1

Choice (C)

32. The tuple | Bose | 8 | 41 | cannot have cross product with any tuple in sailor-1. Choice (D)

33. It returns the tuples that are present in sailor-1 but not in sailor-2, | Ana | 7 | 40 | is present in sailor-1 and sailor-2 also, so this will not appear in the Result of sailor-1 SET DIFFERENCE sailor-2. Choice (D)

34. It violates KEY constraint, because EID is primary key and EID 0589 is already present in the employee table. Choice (B)

35. Employee table references to Department table, Absence of DNo = 5 causes Referential Integrity Constraint violation. Choice (C)