Test

Databases

Time: 60 min.

1. Which of the following are used in DBMS files?
(i) Data dictionary (ii) DML
(iii) Query language (iv) Transaction log
(A) (i) and (ii) (B) (ii) and (iii)
(C) (iii) and (iv) (D) (i) and (iv)

2. Which among the following is not a problem of file management system?
(A) Data redundancy
(B) Lack of data independence
(C) Program independence
(D) None of these

3. A transparent DBMS
(A) cannot hide sensitive information from users
(B) keeps its logical structure hidden from users
(C) keeps its physical structure hidden from users
(D) All of the above

4. If the field size is too small, for the longest piece of data to be entered,
(A) database program will be freezed
(B) field will automatically expand
(C) part of the data will be cut off
(D) All of the above

5. Which of the following functional dependencies are satisfied by the instance from the below relation?

A	*B*	*C*
1	7	3
1	9	5
1	11	5
5	3	3

(A) $AB \rightarrow C$ and $C \rightarrow B$
(B) $BC \rightarrow A$ and $B \rightarrow C$
(C) $BC \rightarrow A$ and $A \rightarrow C$
(D) $AC \rightarrow B$ and $B \rightarrow A$

6. Let E_1 and E_2 be two entities in an E/R diagram with single-valued attributes, R_1 and R_2 are two relationships between E_1 and E_2, R_1 is one to many R_2 is many-to-one. R_1 and R_2 do not have any attributes of their own. What is the minimum number of tables required to represent this situation in the relation model?
(A) 2 (B) 3
(C) 4 (D) 5

7. Which of the following is true about DBMS?
(i) Low-level DMLs are record-at-a time
(ii) High-level DMLs are set oriented or set-at-a time
(iii) Query in high-level DML specify which data to retrieve rather than how.
(iv) When used as standalone, DML is called 'host language'
(A) (i) only (B) (i) and (iii)
(C) (i), (ii) and (iii) (D) (iii) and (iv)

8. In which of the following, the structure of data files is stored?
(A) Metadata (B) Database catalog
(C) Database schema (D) Data model

9. A schedule is a collection of
(A) Data models (B) Transactions
(C) Schemas (D) Tables

10. Select from the following which matches the term 'Impedance mismatch problem':
(A) In compatibility of storage and data structure
(B) Mismatch in user authentication
(C) File structure mismatching
(D) None of these

11. Which of the following is not a/an integrity constraint?
(A) Entity integrity
(B) Candidate key constraint
(C) Business rules
(D) None of the above

12. Select from the following which is concerned with 'Query Optimizer':
(A) Extracts DML commands from an application program in a high-level language
(B) Parsing and analyzing interactive query
(C) Rearrangement and reordering of operations and elimination of redundancies
(D) Performance monitoring

13. Which of the following does not belong to database model?
(A) Relational Model (B) Distributed Model
(C) Hierarchical Model (D) Network Model

14. What is the correct sequence of database design process?
(i) Create conceptual schema
(ii) Data model mapping
(iii) Requirement collection and analysis
(iv) Physical design
(A) iii →i →ii → iv
(B) iii → ii → i → iv
(C) i → ii → iii → iv
(D) i → iii → ii → iv

15. Consider the following schema definitions
Employee {Name, SSN, Address, DNo}
Department {DName, DNumber, Manager, SSN}
Which among the following expressions represent the query $\Pi_{\text{name, address}}(\sigma_{\text{Dname = 'Res'} \wedge \text{DNumber = DNo}}$ (Department $\bowtie$ Employee)?

(A) Retrieve the name and address of employees who work for the project no 'Dno'
(B) Retrieve the name and address of all employees who control the 'Res' department.
(C) Retrieve the name and address of all employees who work for the 'Res' department.
(D) None of these

16. Select from the following which closely resembles the concept 'Degree of a relationship':
(A) Number of entities participating in a relation
(B) Number of entity types participating in a relation
(C) Number of strong entity types in a relation
(D) Number of weak entity types in a relation

17. Consider the following statements in a database:
(i) No primary key value can be NULL
(ii) A tuple in one relation which refers to another relation must refer to an existing tuple in that relation
(iii) The value of x determines the value of y in all states of a relation, where x and y are two attributes of the relation Which of the following combinations matches the given statements in order?
(A) Referential integrity, functional dependency, entity integrity.
(B) Functional dependency, entity integrity, referential integrity
(C) Entity integrity, functional dependency, referential integrity.
(D) Entity integrity, referential integrity, functional dependency

18. Consider the following relation schemas:

Works (emp_name, comp_name,salary)

Livesin (emp_name, street, city)

Location (comp_name, city)

Manager (manager_name)

What is returned by the following relational algebra expression

$\pi_{emp\_name}(\sigma_{comp-name=Time \wedge Works.emp\_name=livesin.emp\_name}$

(Works $\bowtie$ Livesin)
(A) Names of all employees who work for TIME
(B) Names of all employees of TIME who lives in the same city
(C) Names of people who live in the same city
(D) None of these

19. Consider the following SQL query:
Select distinct $a_1, a_2, \ldots, a_n$ from $r_1, r_2 \ldots r_m$ where P
This query is equivalent to one of the following relational algebra expression:
(A) $\pi_{a_1, a_2 \ldots a_n}\sigma_P(r_1 \times r_2 \times \cdots \times r_m)$
(B) $\pi_{a_1, a_2 \ldots a_n}\sigma_P(r_1 r_2 \times \cdots \times r_m)$
(C) $\pi_{a_1, a_2 \ldots a_n}\sigma_P(r_1 \cup r_2 \cup \times \ldots \times \cup r_m)$
(D) $\pi_{a_1, a_2 \ldots a_n}\sigma_P(r_1 r_2 \times \ldots \times r_m)$

20. Let $R_1(A, B, C)$ and $R_2(D, E)$ be two relation schemas with primary keys A and D and C be a foreign key in R_1 referring to R_2. Suppose there is no violation of the above referential integrity constraint in the instances r_1 and r_2, which of the following relational algebra expression would necessarily produce an empty relation?
(A) $\pi_D(r_2) - \pi_C(r_1)$
(B) $\pi_C(r_1) - \pi_E(r_2)$
(C) $\pi_D(r_1 \bowtie_{C=D} r_2) - \pi_B(r_1)$
(D) $\pi_C(r_1 \bowtie_{C=E} r_2)$

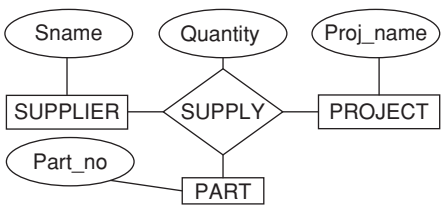
21. Let r be an instance for the schema $R = (A, B, C, D)$. Let $r_1 = \pi_{A,B,C}(r) r_2 = \pi_{A,D}(r)$ and $S = r_1 \bowtie r_2$. Also given that the decomposition of r into r_1 and r_2 is lossy, which of the following is true?
(A) $S \subset r$ (B) $r \cup s = r$
(C) $r \subset s$ (D) $r \bowtie s = s$

22. Which of the following is/are logical database structures?
(A) Network (B) Tree
(C) Chain (D) All of the above

23. A relational database management system manages data in more than one file at a time by using which of the following combinations?
(A) Tables and tuples
(B) Relations and tuples
(C) Tables and Relations
(D) Attributes and tuples

24. Let Emp = (Name, ID, ADDRESS, PHONE, SPOUSE, LIVINGAT) be a relation scheme with following FDs, which one of the following is a key
ADDRESS → Phone
SPOUSE → NAME
SPOUSE, ADDRESS → PHONE
NAME → ID
(A) ADDRESS, PHONE
(B) SPOUSE, ADDRESS
(C) NAME, SPOUSE
(D) NAME, ADDRESS

25. Consider the following E-R diagram



Select the most appropriate statement from the following for the above ER diagram:

(A) Represents a ternary relationship
(B) Represents a binary relationship
(C) Represents a ternary relationship with instances of the form (s, j, p)
(D) Represents 1 – to – many relationships

26. If two relations R_1 and R_2 are such that they are of the same degree and domain of the corresponding fields are also the same, then which one of the following is true about R_1 and R_2?
(A) $R_1 \subset R_2$
(B) $R_1 \cup R_2 = R_2 \cup R_1$
(C) R_1 and R_2 are union compatible
(D) None of these

Common data questions for 27 and 28: Let Employee and Guests be two relations with attributes (id, mobl_no, name, address) and (id, mob–no, comps_working, shifts) Relations respectively {id, mob_no} is the key for both.

27. Which of the following queries are equivalent?
(i) π_{id} (Employee $\bowtie$ Guests)
(ii) π_{id} (Employee) $\bowtie$ π_{id}(Guests)
(iii) π_{id}{(Employee–Guest) $\cap$ Guest–Employee)}
(iv) π_{id} { $\pi_{id, mob}$(Employee) $\cap$ $\pi_{id, mob}$(Guest)}
(A) (ii) and (iii) (B) (ii), (iii) and (iv)
(C) (i), (ii) and (iv) (D) (ii) and (iv) only

28. What does the following relational algebra expression represent?
π_{id} (π_{id, mob_no}(Employee–Guests))
(A) Id of all employees working with the company
(B) Id of all permanent employees
(C) Id of part time employees
(D) None of these

Common data for questions 29 and 30:

29. Let R_1 and R_2 be two relations with attributes a_1 and a_2. P_1 and P_2 be two predicates.
Select the expression from the following which is wrong:
(A) $\sigma_{P_1}(\sigma_{P_1}(R_1)) \rightarrow \sigma_{P_2}(\sigma_{P_2}(R_1))$
(B) $\sigma_{P_1}(\pi_{a_1}(R_1)) \rightarrow \pi(\sigma_{a_1}(\sigma_{P_1}(R_1)))$
(C) $\sigma_{P_1}(R_1 \cup R_2) \rightarrow \sigma_{P_1}(R_1) \cup \sigma_{P_2}(R_2)$
(D) $\pi_{a_2}(\sigma_{a_1}(R_1)) \rightarrow \sigma_{P_1}(\pi_{a_2}(R_1))$

30. Select from the following corresponding TRC for the wrong expression in the above question:
(A) $\{t/\ \exists u, R_1(t[P_1]) = R_2(u[P_1])\}$
(B) $\{t/\ \forall u, R_1(t[P_1]) = R_1(u[P_1])\}$
(C) $\{t/\ \exists u, R_1(t[P_1]) \neq R_2(u([P_1])\}$
(D) $\{t/\square(t \in R_1)\}$

Answer Keys

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

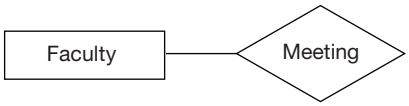
DATABASE TEST 1

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:

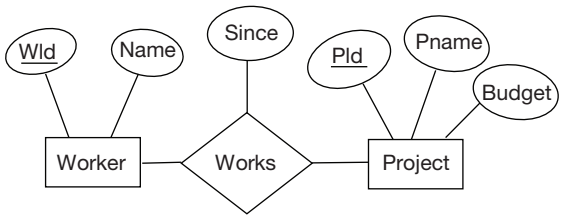
1. Consider the given ER-Diagram



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
$T_1 \bowtie (T_1 \cdot P = T_2 \cdot A$ 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
$T_1 \bowtie (T_1 \cdot P = T_2 \cdot A$ 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

EId	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

$\therefore$ 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(3^{rd} tuple). Choice (B)

29. Refer the table given in the above solution.
$T_1 \cdot P = T_2 \cdot A$
1^{st}, 3^{rd}, 8^{th} 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)

DATABASE TEST 2

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

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

1. If the database operations in a transaction do not update the database but only retrieve data, what is that transaction called?
(A) Write-only operation (B) Read-only operation
(C) Named data item (D) Granularity

2. Consider the 2 interleaved transactions T_1 and T_2:

T_1	T_2
$r_1(x)$	
$w_1(x)$	
	$r_2(x)$
$r_1(y)$	
$w_1(y)$	
	$r_2(y)$
C_1	
	C_2

Which of the following is schedule for the above?
(A) $r_1(x), r_2(x), w_1(x), r_1(y), w_1(y), r_2(y), C_1, C_2$
(B) $r_1(x), w_1(x), r_2(x), r_1(y), w_1(y), r_2(y), C_1, C_2$
(C) $r_1(x), w_1(x), r_2(x), r_1(y), w_1(y), r_2(y), C_2, C_1$
(D) $r_1(x), w_1(x), r_2(x), r_1(y), r_2(y), w_1(y), C_1, C_2$

3. Two operations in a schedule are said to have conflict if
I. They belong to different transactions.
II. They access the same data item.
III. Atleast one of the operations is write operation.
IV. Atleast one of the operations is Read operation.
Which of the following is TRUE?
(A) I and II only (B) II and III only
(C) I, II and III only (D) II, III and IV only

4. A Non recoverable schedule must contain which of the following conflict?
(A) RR conflict (B) RW conflict
(C) WR conflict (D) WW conflict

5. Consider the given schedule:

T_1	T_2
$r_1(x)$	
$w_1(x)$	
$r_1(y)$	
C_1	
	$r_2(x)$
	$w_2(x)$
	C_2

The given schedule is
(A) Cascadeless schedule
(B) strict schedule
(C) Non-serial schedule
(D) Non-Recoverable schedule

6. In a schedule, transactions can neither read nor write an item 'X' until the last transaction that wrote X has committed or Aborted, what is that schedule?
(A) Cascadeless schedule (B) Strict schedule
(C) Recoverable schedule (D) Non serial schedule

7. Consider the given schedule

T_1	T_2
$R(x)$	
$x = x - N$	
$w(x)$	
	$r(x)$
	$w(x)$
$r(y)$	

What is the number of WR conflicts present in the given schedule?
(A) 0 (B) 1
(C) 2 (D) 3

8. Which of the following protocol is based on locking data items to prevent concurrent transactions from interfering with one another, and enforcing an additional condition that guarantees serializability?
(A) 1 PL (B) 2 PL
(C) 3 PL (D) 4 PL

9. In Random access, for accessing a disk block on a disk, what is the Rotational delay if disk rotates at 10000 rpm (rotations per minute)?
(A) 6 m/sec (B) 9 m/sec
(C) 3 m/sec (D) 12 m/sec

10. Whenever 2 independent 1:N relationships A:B and A:C are mixed in the same relation, then which of the following is TRUE?
(A) A Transitive Dependency may arise
(B) A Partial Dependency may arise
(C) A Multi-valued Dependency may arise
(D) None of the above

11. Which of the following is TRUE about 2NF?
(A) A relation schema R is in 2 NF, if every non prime attribute A in R is not partially dependent on any key of R.
(B) If the primary key contains a single attribute, the test need not be applied at all.
(C) Test for 2NF involves testing for functional dependencies whose left-hand side attributes are part of the primary key.
(D) All the above

12. Consider the following *FD*'s:
$X \rightarrow Y$
$WY \rightarrow Z$
If pseudo transitive rule is applied on given *FD*'s, what is the result?
(A) $X \rightarrow Z$ (B) $XW \rightarrow Z$
(C) $XY \rightarrow Z$ (D) $XWY \rightarrow YZ$

13. What is the average time to access a specific Record in a file using sequential scan (Linear search) on unordered file? (Assume that there are '*b*' blocks)
(A) $b/2$ (B) b
(C) $\log_2 b$ (D) $2b$

14. In which hashing technique, a type of directory, an array of '2^d' bucket addresses is maintained, where '*d*' is called the global depth of the directory?
(A) Internal Hashing (B) Extendible Hashing
(C) Separate Chaining (D) Static Hashing

15. Assume that, a primary index is built on a file with 45 blocks, what is the number of block accesses required to search for a specific Record in a file (Using Binary search)?
(A) 45 (B) 23
(C) 6 (D) 7

16. Consider the given 2 schedules:
S_a: $r_1(x), w_1(x), r_2(x), w_1(x), w_2(x), r_1(y), C_1, C_2$
S_b: $r_1(x), w_1(x), r_2(x), w_2(x), r_1(x), C_1, C_2$
Which of the following is TRUE?
(A) Both are conflict serializable
(B) Only S_a is conflict serializable
(C) Only S_b is conflict serializable
(D) Both are not conflict serializable

17. Consider the given transaction T_1, that follows 2-phase Locking protocol:

T_1
1. Read – Lock(X)
2. Read – item (X)
3. Write – Lock(Y)
4. Unlock(X)
5. Read – item(Y)
6. Y = X + Y
7. Write – item(Y)
8. Unlock(Y)

Which of the following is TRUE?
(A) Record 1 to Record 3 is Growing phase
(B) Record 4 to Record 8 is shrinking phase
(C) Record 1 to Record 4 is Expanding phase
(D) Both (A) and (B)

18. Consider a disk with track size 70 Kbytes and it rotates at 3600 rpm, what is the transfer rate in bytes/m sec?
(A) 3500 (B) 3600
(C) 4200 (D) 4500

19. What is the time required to transfer consecutively '*k*' non contiguous blocks that are on the same cylinder, where '*S*' is seek time, '*rd*' is rotational delay and '*btt*' is block transfer time?
(A) $S + (k * (rd + btt))$ msec
(B) $(S + rd + btt)$ msec
(C) $S + rd + (k * btt)$ msec
(D) $S + (k * rd) + btt$ msec

20. What is the estimate for transferring consecutive blocks (include interblock gap), the disk manufacturer provides a bulk transfer rate (btr) that takes the gap size into account when reading consecutively stored blocks (B), and the gap size is *G* bytes?
(A) btr = $(B/(B + G))$ * tr bytes/msec
(B) btr = $(B/(B + G))$ bytes/msec
(C) btr = $(B + G)$ + tr bytes/msec
(D) btr = $((B + G)/B)$ + tr bytes/msec

21. Match the following:
I. 1 NF
II. 2 NF
III. 3 NF
P. No Non key attribute should be functionally dependent on a part of the primary key.
Q. Relation should have no nonatomic attributes or nested relations.
R. Relation should not have a non key attribute functionally determined by another non key attribute.
(A) I–P, II–Q, III–R
(B) I–Q, II–P, III–R
(C) I–Q, II–R, III–P
(D) I–R, II–Q, III–R

22. Consider the given Relation EMP and given functional dependencies:
$F = (E \rightarrow N$
$P \rightarrow A, L$
$E P \rightarrow H)$
Which of the following is Incorrect closure set with respect to *F*?
(A) $E^+ = \{E, N\}$
(B) $P^+ = \{P, A, L\}$
(C) $\{EP\}^+ = \{E, N, P, A, L, H\}$
(D) $\{EH\}^+ = \{E, N, H, P, A\}$

23. Consider the functional dependencies given in the above question, EMP Relation is in which Normal Form?
(A) 1 NF (B) 2 NF
(C) 3 NF (D) BCNF

24. Consider the given 2 tables:
Person

Name	Mobile
Anil	9848463 9440072
Raj	9004432

Student

SName	Project	
	P No.	Hours

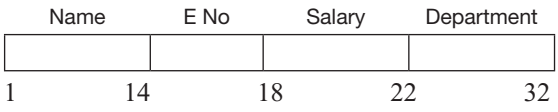
Which of the following is TRUE?
(A) Both tables are in 1 NF
(B) Both tables are not in 1 NF
(C) Person is in 1 NF but not student
(D) Person is in 2 NF and student is in 1 NF

25. Consider the schema $R(ABCDE)$ and functional dependencies $A \rightarrow BE$, $C \rightarrow D$, then the decomposition of R into $R_1(ABE)$, $R_2(CD)$ is
(A) Dependency preserving and lossless join.
(B) Dependency preserving and not lossless join.
(C) Lossless join but not dependency preserving.
(D) Not Dependency preserving and Not lossless join.

26. Consider a relation $R(A, B, C, D, E)$ with the following Dependencies:
$A \rightarrow C$
$BCD \rightarrow E$
$DE \rightarrow B$
Identify the candidate keys from the following options?
(A) AD, ADB (B) ADB, ADC
(C) ADB, ADE (D) ADC, ADE

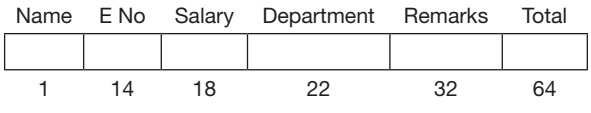
27. Consider the Functional Dependencies given in the above question, which of the following are "Prime Attributes"?
(A) $ABCD$ (B) $ABCE$
(C) $ABDE$ (D) $ACDE$

28. Consider a file with fixed length records, one sample record is given below,



The file contains 32000 records, and it is stored on a disk with block size 1024 Bytes, what is the blocking factor?
(A) 16 (B) 32
(C) 64 (D) 128

29. Consider a file with Fixed length Records, one sample record is given below.



The file contains 30000 records, what is the number of blocks required to store the file, on a disk with block size 2048 bytes?
(A) 648 (B) 840
(C) 938 (D) 968

30. Construct a B-tree with 6, 4, 5, 9, 7, 2 values, order of B-tree is $P = 3$, what is the maximum number of node splits?
(A) 1 (B) 2
(C) 3 (D) 4

31. Consider a disk with block size $B = 512$ bytes, number of tracks per surface is 400, this disk pack consists of 16 double sided disks, How many cylinders are there?
(A) 100 (B) 200
(C) 400 (D) 800

Common Data Questions 32 and 33:
Consider the given schedules
S_1: $r_1(P), r_2(R), r_1(R), r_3(P), r_3(Q), w_1(P), C_1, w_3(Q), C_3, r_2(Q), w_2(R), w_2(Q), C_2$
S_2: $r_1(P), r_2(R), r_1(R), r_3(P), r_3(Q), w_1(P), w_3(Q), r_2(Q), w_2(R), w_2(Q), C_1, C_2, C_3$.

32. Which of the following is/are Recoverable schedule(s)?
(A) Only S_1 (B) Only S_2
(C) Both S_1 and S_2 (D) Neither S_1 nor S_2

33. Which of the following is/are "cascadeless" schedules(s)?
(A) Only S_1
(B) Only S_2
(C) Both S_1 and S_2
(D) Neither S_1 nor S_2

Linked Answer Questions 34 and 35:
Consider the given table:

Student

Sname	Course	Department
Arun	C_1	D_1
Arun	C_2	D_1
Arun	C_1	D_2
Arun	C_2	D_2

34. Student table has multivalved dependencies, which of the following is correct 4 NF Decomposition?
(A) Student 1 (Sname, course)
Student 2 (Course, Department)
(B) Student 1 (Sname, Department)
Student 2 (course, Department)
(C) Student 1 (sname, course)
Student 2 (sname, Department)
(D) Student 1 (sname, course)
Student 2 (sname, Department)
Student 3 (Course, Department)

35. Which of the following is TRUE, for the above identified correct answer?
(A) student 1 $\bowtie$ student 2, returns student table
(B) student 1 X student 2 returns student table
(C) student 1 $\bowtie$ student 2 returns student table
(D) None of the above

Answer Keys

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

Hints and Explanations

1. Read only operation do not update the database but only retrieves data. Choice (B)

2. Correct schedule is:
$r_1(x), W_1(x), r_2(x), r_1(y), w_1(y), r_2(y), C_1, C_2$
Choice (B)

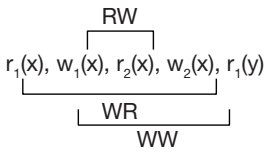
3. Two operations in a schedule are said to have conflict if they satisfy I, II and III.
Choice (C)

4. Recover ability can be decided by the presence of 'RW' conflict in a schedule.
Choice (B)

5. A schedule is said to be cascadeless, if every transaction in the schedule reads only items that were written by committed transactions. Choice (A)

6. More restrictive type of schedule is called a strict schedule, in which transactions can neither read nor write an item 'X' until the last transaction that wrote 'X' has committed or aborted.
Choice (B)

7.



$\therefore$ One WR conflict is present. Choice (B)

8. 2 PL (2 phase Locking protocol) ensures serializability.
Choice (B)

9. If the speed of disk rotation is 'P' revolutions per minute (rpm), then the average rotational delay 'rd' is given by
$rd = (1/2) * (1/P)$ min $= (60 * 1000)/(2 * P)$ msec
$rd = 3$ msec Choice (C)

10. If 2 independent 1:N relationships A:B and A:C are mixed in the same Relation, a multi valued Dependency may arise. Choice (C)

11. All the statements are TRUE.
Choice (D)

12. $X \rightarrow Y$
$WY \rightarrow Z$
$XW \rightarrow Z$
Choice (B)

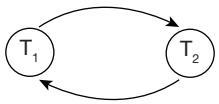
13. The average access time in block accesses to find a specific record in a file with 'b' blocks on unordered file is '$b/2$'. Choice (A)

14. Hashing Technique that allows Dynamic File expansion is extendible hashing, Choice (B)

15. First search will be conducted on primary index. By using binary search,
$\Rightarrow \lceil \log^{45} \rceil \cong 6$ block accesses
6 block accesses in primary index + 1 block access in original file.
$\therefore$ 7 block accesses. Choice (D)

16. S_a: $r_1(x), w_1(x), r_2(x), w_1(x), w_2(x), r_1(y), C_1, C_2$

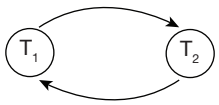
Precedence Graph:



$\therefore$ 'S_a' is not conflict serializable, since cycle is present in Precedence graph.

S_b: $r_1(x), w_1(x), r_2(x), w_2(x), r_1(x), C_1, C_2$

Precedence Graph:



$\therefore$ S_b is not conflict serializable, since cycle is present in precedence graph. Choice (D)

17. **Expanding or growing phase:** During which new locks on items can be acquired but none can be released. **Shrinking phase:** During which existing locks can be released but no new locks can be acquired.
Choice (D)

18. Transfer rate = $(70 \times 1000)/(60 \times 1000/3600)$

$$\frac{70 \times 1000}{\frac{1000}{60}} = \frac{70 \times 60 \times 1000}{1000} = 4200 \text{ bytes/msec}$$

Choice (C)

19. To transfer consecutively 'k' non contiguous blocks that are on the same cylinder, we need approximately,
$S + (k * (rd + btt))$ msec. Choice (A)

20. Transferring consecutive blocks (including inter block gap)

$\Rightarrow$ btr = $(B/(B + G))$ * tr bytes/msec Choice (A)

21. I – Q, II – P, III – R is correct match. Choice (B)

22. $\{EH\}^+$ cannot determine P and A. Choice (D)

23. The key for EMP is $\{EP\}$ and the functional Dependencies. $E \rightarrow N$

$P \rightarrow A$, L are partial dependencies.

$\therefore$ EMP is not in 2NF i.e., it is in 1 NF. Choice (A)

24. Both tables are not in 1 NF, person table has multiple values under mobile column for one name, In student relation, there is another relation project, A relation within a Relation is not allowed in 1 NF. Choice (B)

25. It is Dependency preserving, $A \rightarrow BE$ is in R_1 and $C \rightarrow D$ is in R_2.

Checking for loss less join:

	A	B	C	D	E
R_1(ABE)	*	*			*
R_2(CD)			*	*	

It is Not Loss Less JOIN. Choice (B)

26. $A \rightarrow C$

$BCD \rightarrow E$

$DE \rightarrow B$

L	M	R
AD	BCE	

$\{AD\}^+ = \{ADC\}$

$ADB^+ = \{ADBCE\}$

$ADC^+ = \{ADC\}$

$ADE^+ = \{ADECB\}$ Choice (C)

27. Candidate keys are: ADB, ADE

Prime Attributes are part of any candidate key, $ABDE$

Choice (C)

28. Blocking factor is defined as, the number of records stored on one block.

$$Bfr = \left\lfloor \frac{1024}{32} \right\rfloor = \left\lfloor \frac{2^{10}}{2^5} \right\rfloor = 2^5 = 32 \text{ Records}$$

Choice (B)

29. Blocking Factor

$$= \left\lfloor \frac{2048}{64} \right\rfloor = \left\lfloor \frac{2^{11}}{2^6} \right\rfloor = 2^5 = 32 \text{ records/block}$$

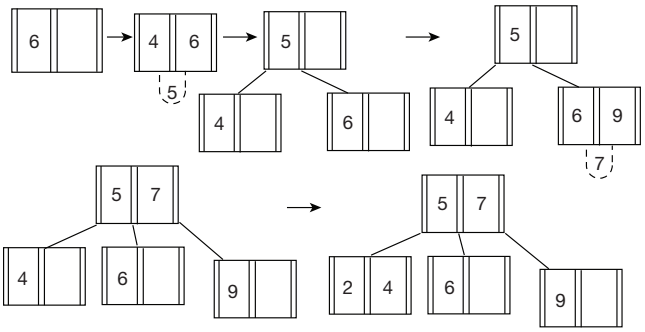
Number of blocks required:

1 block --------- 32 records

x ---------- 30000 records

$$x = \left\lceil \frac{30000}{32} \right\rceil = \lceil 937.5 \rceil = 938 \text{ blocks}$$ Choice (C)

30. Order $P = 3$



$\therefore$ 2 Node splits Choice (B)

31. Cylinders = Number of tracks that is 400 Choice (C)

32. S_1: $r_1(P), r_2(R), r_1(R), r_3(P), r_3(Q), W_1(P), C_1, w_3(Q), C_3, r_2(Q), w_2(R), w_2(Q), C_2$

To check recoverability, search for RW conflict. There is one RW conflict, T_3 is performing write operation so it has to commit first.

$\therefore$ S_1 is Recoverable.

S_2: $r_1(P), r_2(R), r_1(R), r_3(P), r_3(Q), w_1(P), w_3(Q), r_2(Q), w_2(R), w_2(Q), C_1, C_2, C_3$.

T_3 has to commit first but T_2 has committed first.

$\therefore$ S_2 is not a recoverable schedule. Choice (A)

33. S_1:

T_1	T_2	T_3
$r_1(P)$		
	$r_2(R)$	
$r_1(R)$		
		$r_3(P)$
		$r_3(Q)$
$w_1(P)$		
C_1		
		$w_3(Q)$
		C_3
	$r_2(Q)$	
	$w_2(R)$	
	$w_2(Q)$	
	C_2	

S_1 is cascadeless, because, data is taken from committed transactions.

S_2:

T_1	T_2	T_3
$r_1(P)$		
	$r_2(R)$	
$r_1(R)$		
		$r_3(P)$
		$r_3(Q)$
$w_1(P)$		
		$w_3(Q)$
	$r_2(Q)$	
	$w_2(R)$	
	$w_2(Q)$	
C_1		
	C_2	
		C_3

T_3 should commit before T_2
$\therefore$ S_2 is not cascadeless schedule.

Choice (A)

34. Multi valued dependencies:
Sname $\rightarrow\rightarrow$ Course, Sname $\rightarrow\rightarrow$ Department
4NF decomposition is as follows
Student 1(Sname, course)
Student 2(Sname, Department)

Choice (C)

35. Student 1 $\bowtie$ student 2 returns student table.

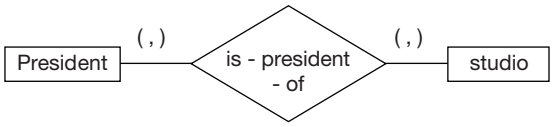
Choice (A)

DATABASE TEST 3

Number of Questions: 25 **Section Marks: 30**

Directions for questions 1 to 25: Select the correct alternative from the given choices.

1. A studio can have at most one president and a president can preside at most one studio.



Which of the following is correct cardinality ratio, for the above description?

(A) (0, 1), (1, *n*) (B) (0, 1), (0, 1)
(C) (1, *n*), (0, 1) (D) (1, *n*), (1, *n*)

2. A movie award goes exactly to one movie. A movie may be awarded multiple awards (but may be none at all). Which of the following is correct cardinality ratio, for the above description?

(A) (0, 1), (1, *n*) (B) (1, 1), (1, *n*)
(C) (1, 1), (0, ∗) (D) (1, 1), (1, ∗)

3. Match the following:

I. Conceptual Database design
II. Logical Database design
III. Physical Database design
P. Transforms the conceptual schema into the data model supported by the DBMS.
Q. Design indexes, table distribution, buffer size etc.
R. Produces the initial model.

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

Common Data for Questions 4 and 5:

```
CREATE TABLE Emp        (EId INT
    Name CHAR(50)
    mgr-Id : INT
    SSNo: INT UNIQUE
    DNo: INT
    Salary: INT
    Primary key (EId)
    Foreign key DNo  References Dept  (DNo))
```

4. If a tuple is inserted into the table Emp, which violation would never occur?

(A) Key constraint
(B) Entity Integrity constraint
(C) Referential Integrity constraint
(D) Unique constraint

5. If a tuple value is updated in Emp table, which violations would never occur?

(A) Key constraint
(B) Referential Integrity constraint
(C) UNIQUE Constraint
(D) None of the above

6. Student (RNo, Name, Marks, Subject)
For each Subject, Retrieve the Subject, maximum marks in that subject.
In the SQL query which clause will not appear?

(A) SELECT
(B) GROUPBY
(C) FROM
(D) WHERE

7. Which of the following is NOT a Relational algebra operator used in basic queries?

(A) JOIN (B) PROJECT
(C) SELECT (D) LOCATE

8. What does the asterisk (∗) in SQL mean?

(A) It is a standard symbol used to start a query.
(B) It is a wild card symbol that requests inclusion of all attributes.
(C) It is an interruption symbol used to abort a query if it takes longer to process than a prescribed time length.
(D) None of the above

9. Consider the given functional dependencies
$R(A, B, C, D)$:
$FD = \{A \rightarrow B$
$C \rightarrow B$
$D \rightarrow B\}$
The given Relation is in which Normal Form?

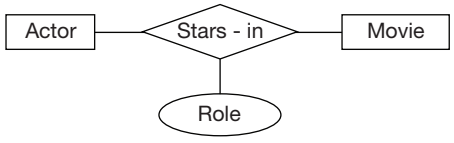
(A) 1 NF (B) 2 NF
(C) 3 NF (D) BCNF

10. For a Relation scheme R(ABC), Assume that all attributes are prime attributes, Then minimum '*R*' is in which Normal Form?

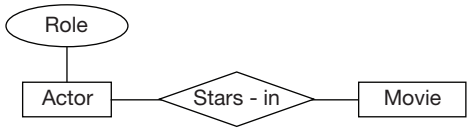
(A) 1 NF (B) 2 NF
(C) 3 NF (D) BCNF

11. Which of the following model, describes the fact that a role is stored for every pair of actor '*X*' and movie '*Y*' such that '*X*' starred in '*Y*'.

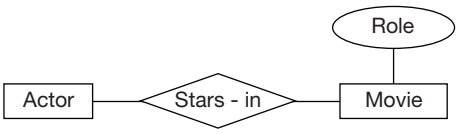
(A)



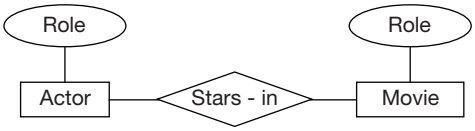
(B)



(C)



(D)



12. Consider the given ER-Diagram:

Which of the following is TRUE?

(A) one instructor teaches many courses, but each course is run by exactly one instructor.
(B) One instructor teaches atmost one course.
(C) An instructor may not take even a single course.
(D) One instructor teaches one course, but each course is run by many instructors.

13. Consider the given Functional dependencies.
For a Relation R(ABCDE):
$A \rightarrow B$
$B \rightarrow C$
$BC \rightarrow A$
$A \rightarrow D$
$E \rightarrow A$
$D \rightarrow E$
Which of the following is not a key?

(A) B (B) C
(C) D (D) E

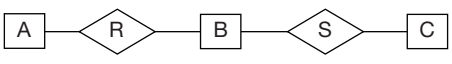
14. Consider a Relation $R(ABCDE)$ with following functional dependencies:
$ABC \rightarrow DE$
$D \rightarrow AB$
What is the number of candidate keys for the Relation R?

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

15. Suppose relation $R(A, B)$ currently has tuples $\{(2, 3), (2, 4), (4, 5)\}$ and Relation $S(B, C)$ currently has $\{(3, 6), (5, 7), (8, 9)\}$. What is the number of tuples in the result of the SQL query
SELECT * FROM R NATURAL OUTER JOIN S?

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

16. Consider the following ER-Diagram:



What is the minimum number of tables required to represent given ER-Diagram?

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

17. To find the EId of the Employees that are managed by people who are managed by the employee with EId 456.
Consider the following Queries:

I. SELECT E.EId
FROM Emp E, Emp F
WHERE E.MgrId = F.EId AND F.MgrId = 456

II. SELECT EId
FROM Emp
WHERE MgrId IN (SELECT EId
FROM Emp
WHERE MgrId = 456)

Which query will correctly get the desired set of Employee IDs?

(A) I only (B) II only
(C) Both I and II (D) Neither I nor II

18. Consider the following functional dependencies
$AB \rightarrow C$
$C \rightarrow D$
$AB \rightarrow D$
Which of the following is CORRECT minimal set?

(A) $A \rightarrow C$ $C \rightarrow D$
(B) $AB \rightarrow C$ $C \rightarrow D$
(C) $B \rightarrow C$ $C \rightarrow D$
(D) $AB \rightarrow C$ $AB \rightarrow D$

19. Consider the following functional dependencies:
$R(ABCD)$
$AB \rightarrow C$
$C \rightarrow A$
$D \rightarrow B$
$AB \rightarrow D$
What are the keys possible for Relation R?

(A) AC, BD, CD (B) AB, BC, CD
(C) AB, AD, BC, CD (D) AC, BC, BD

20. Sailor (Sid, Sname, Rating, age)
Reserves (Sid, bid)
Boats (bid, bname, color)
To select the names of sailors who have reserved all the boats, which Relational algebra operation is used specifically, to do the under lined part?

(A) OUTER JOIN (B) UNION
(C) DIVISION (D) EXCEPT

21. Student1 (RNo, Name, CNo, CName)
Student2 (RNo, Name, CNo, CName)

I. $\pi_{Name}(\sigma_{CNO = 'C2'}(\text{student1} - \text{student2}))$
II. $\pi_{Name}(\sigma_{CNO = 'C2'}(\text{student2} - \text{student1}))$

Which of the following is TRUE in most of the cases about Number of tuples appear in the result of I and II?

(A) I ≠ II (B) I < II
(C) I > II (D) I = II

22. Consider the following:

I. $\{P/\exists S \in \text{student } \exists D \in \text{Department}$ (S.RNo = D.RNo. $\wedge$ D. DNo. = 5 $\wedge$ P.Sname = S.Sname)

II. $\{< S_N > / \exists\ S_R, S_N (< S_R, S_N > \in \text{student} \wedge \exists\ D_R, D_N (< D_R, D_N > \in \text{Department} \wedge S_R = D_R\, D_N = 5))\}$

Which of the following is TRUE about given expressions?

(A) I – Tuple Relational Calculus
II – Relational algebra
(B) I – Tuple Relational Calculus
II – Domain Relational Calculus
(C) I – Domain Relational Calculus
II – Tuple Relational Calculus
(D) I – Relational Algebra
II – Domain Relational Calculus

23. Consider 2 Relations R and S, If we want to Retrieve all the tuples from both R and S without losing any tuple, which Relational Algebra operator is used?

(A) NATURAL JOIN
(B) LEFT OUTER JOIN
(C) INNER JOIN
(D) FULL OUTER JOIN

24. Assume that table A has 5 columns, table B has 4 columns, one column is common in both the tables. What is the number of columns appear in the result of NATURAL JOIN, LEFT OUTER JOIN, FULL OUTER JOIN respectively?

(A) 8, 9, 9 (B) 8, 8, 9
(C) 8, 8, 8 (D) 8, 9, 8

25. Consider the following Query in English:

"Retrieve the names of students who scored more than 90% but whose age is not more than 15?"

Which Relational operator is compulsory in SQL?

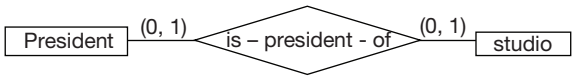
(A) INTERSECTION (B) NATURAL JOIN
(C) OUTER JOIN (D) SET-DIFFERENCE

Answer Keys

1. B	**2.** C	**3.** A	**4.** C	**5.** D	**6.** D	**7.** D	**8.** B	**9.** A	**10.** C
11. A	**12.** A	**13.** B	**14.** B	**15.** C	**16.** C	**17.** C	**18.** B	**19.** C	**20.** C
21. A	**22.** B	**23.** D	**24.** C	**25.** D					

Hints and Explanations

1.



Choice (B)

2. "*" may be used as maximum if there is no limit (0, *) means no restriction at all (general relationship)
– "A movie award goes exactly to one movie" (1, 1)
– A movie may be awarded multiple awards but may be none at all (0, *). Choice (C)

3. The correct match is I – R, II – P, III – Q.
Choice (A)

4. – If we insert some value which already exists, under primary key column, key constraint is violated.
– If we insert NULL value under primary key column Entity Integrity constraint is violated.
– If we insert some value which already exists under the column 'SSNO' which is declared as UNIQUE in the schema, UNIQUE constraint is violated.
Choice (C)

5. All violations are possible with updation operation. Refer above solution. Choice (D)

6. The query will be
SELECT Subject, MAX(Marks)
FROM Student
GROUPBY Subject Choice (D)

7. LOCATE is NOT a Relational algebra operator.
Choice (D)

8. It is a wild card symbol that requests inclusion of all attributes. Choice (B)

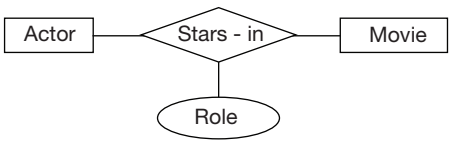
9. $A \rightarrow B$
$C \rightarrow B$
$D \rightarrow B$

L	M	R
ACD		B

$(ACD)^+ = \{ACDB\}$ Prime Attributes = ACD
Non prime Attributes = B
$A \rightarrow B$
$\downarrow$ Non prime Attribute
Partial Key
It violates 2NF.
$\therefore$ The Relation is in 1 NF. Choice (A)

10. If All attributes are prime attributes, then a Relation R is in minimum 3 NF. Choice (C)

11.



Describes the fact that a Role is stored for every pair of actor '*X*' and '*Y*' such that *X* starred in *Y*. Choice (A)

12. One instructor teaches many courses (0, ∗). Each course is run by exactly one Instructor (1, 1).
Choice (A)

13. $A \to B$
$B \to C$
$BC \to A$
$A \to D$
$E \to A$
$D \to E$

L	M	R
	ABCD E	

$A^+ = \{ABCDE\}$
$B^+ = \{BCADE\}$
$C^+ = \{C\}$
$D^+ = \{DEABC\}$
$E^+ = \{EABCD\}$
$\therefore$ '*C*' is not the key. Choice (B)

14.

L	M	R
C	ABD	E

$C^+ = \{C\}$ *x*
$CA^+ = \{CA\}$
$CB^+ = \{CB\}$
$CD^+ = \{CDABE\}$
Candidate key = *CD* Choice (B)

15.
R S

A	B
2	3
2	4
4	5

B	C
3	6
5	7
8	9

R NATURAL OUTER JOIN S

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

$\therefore$ 4-Tuples appear in the Result. Choice (C)

16. Minimum, for every entity one table is required. Since there are 3 entities *A*, *B*, *C*, we need minimum 3 tables.
Choice (C)

17. Both queries will correctly give the desired set of Employee Ids. Choice (C)

18. $AB \to C$
$C \to D$
$AB \to D$
Minimal cover:
$AB \to C$
$C \to D$ Choice (B)

19. $AB \to C$
$C \to A$
$D \to B$
$AB \to D$

L	M	R
	ABCD	

$A^+ = \{A\}$
$B^+ = \{B\}$
$C^+ = \{CA\}$
$D^+ = \{DB\}$
$AB^+ = \{ABCD\}$
$AC^+ = \{AC\}$
$AD^+ = \{ADBC\}$
$BC^+ = \{BCAD\}$
$BD^+ = \{BD\}$
$CD^+ = \{CDAB\}$
Keys are *AB*, *AD*, *BC*, *CD*. Choice (C)

20. If an SQL query contains "Select – all" term, DIVISION operation is used. Choice (C)

21. (Student1 – Student2) ≠ (Student2 – Student1) option (B) and option (C) depends on the number of tuples in first specified Relation. Choice (A)

22. Both Queries return the names of students Whose department number is 5.
I – Tuple Relational Calculus
II – Domain Relational Calculus Choice (B)

23. FULL OUER JOIN returns all the tuples of Both the tables. Choice (D)

24. Table *A* has 5 columns
Table *B* has 4 columns
One column is common to both the tables. In the Result of NATURAL JOIN, LEFT OUTER JOIN, FULL OUTER JOIN, duplicate columns are not allowed, (5 columns + 3 columns) = 8 columns. Choice (C)

25. The query will be as follows
SELECT name
FROM student
WHERE marks > 90
SET DIFFERENCE
SELECT name
FROM student
WHERE age > 15. Choice (D)