

Q23. When ordering data is entered in the format shown below, which of the following is appropriate to check whether the order date is on a business day that is the same as or prior to the entering date?

Ordering data

Form number (Characters)	Order date (Characters)	Product code (Characters)	Quantity (Number)	Customer code (Characters)
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- a) Duplication check
- b) Format check
- c) Logical check
- d) Sequence check

Q24. Which of the following is the appropriate explanation of attributes in the relational model?

- a) It is possible to define attributes that have no name.
- b) The domains of definition for attributes within a relation must not overlap.
- c) The same name can be given to two (2) or more attributes in a relation.
- d) There is no meaning in the order of attributes within a relation, and the relation is the same even if the order is changed.

Q25. When an ER diagram is translated into a set of tables in a relational database, which of the following is an appropriate method to translate a many-to-many relationship between two entities?

- a) Combine two entities and create a single table.
- b) Create a table for each entity and import the primary key from a table of smaller size to a table of larger size.
- c) Create a table for each entity and import the primary key from one table to another table, and vice versa.
- d) Create a table for each entity and then create a new table and import the primary keys from both entities to the new table.

Q26. Which of the following is a clause that is inserted into blank *A* of the SQL statement that calculates the average scores for each class and each subject from the “MidtermTest” table, and displays them in ascending order of class and subject?

MidtermTest (Class, Subject, StudentNumber, Name, Score)

[SQL statement]

```
SELECT Class, Subject, AVG(Score) AS AverageScore  
FROM MidtermTest
```

A

- a) GROUP BY Class, Subject ORDER BY Class, AVG(Score)
- b) GROUP BY Class, Subject ORDER BY Class, Subject
- c) GROUP BY Class, Subject, StudentNumber
ORDER BY Class, Subject, AverageScore
- d) GROUP BY Class, AverageScore
ORDER BY Class, Subject, AverageScore

Q27. The tables “Flight” and “City” are created as shown below. Which of the following is the SQL to output the flight code, its origin city name, and its destination city name from those tables?

Flight: (FlightCode, OriginCityID, DestinationCityID)

City: (CityID, CityName)

a)	SELECT FlightCode, City.CityName, City.CityName FROM Flight, City WHERE Flight.OriginCityID = City.CityID AND Flight.DestinationCityID = City.CityID
b)	SELECT FlightCode, OriginCityID, DestinationCityID FROM Flight, City WHERE Flight.OriginCityID = City.CityID AND Flight.DestinationCityID = City.CityID
c)	SELECT FlightCode, c1.CityName, c2.CityName FROM Flight, City c1, City c2 WHERE Flight.OriginCityID = c1.CityID AND Flight.DestinationCityID = c2.CityID
d)	SELECT f1.FlightCode, c1.CityName, c2.CityName FROM Flight f1, Flight f2, City c1, City c2 WHERE f1.OriginCityID = c1.CityID AND f2.DestinationCityID = c2.CityID

Q28. For the description of the lock granularity of an RDBMS below, which of the following is an appropriate combination of A and B ?

Each pair of transactions that are processed in parallel updates multiple rows in a single table. When a row-level lock and a table-level lock are compared, lock contention is more likely to occur when an -level lock is used. More RDBMS memory area is required when a -level lock is used in order to manage the lock while transactions are being processed.

	A	
a)	ro	row
b)	ro	table
c)	tabl	row
d)	tabl	table

Q25. When the relationships between continent and country, and between country and city are shown in the class diagram below, which of the following is an appropriate combination of multiplicities that are to be inserted into blank *A* through blank *D*? Here, there are no cross continental countries. Each continent has at least one country, and each country has at least one city.



	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
a)	1..1	1..*	1..*	1..1
b)	1..1	1..*	1..1	1..*
c)	1..1	0..*	0..*	1..1
d)	1..1	0..*	1..1	0..*

Q26. Tables Course and Section were created to record the course and section information of a university, respectively, as shown below; the primary keys are underlined.

Course (cid, title, credits)

Section (cid, secid, semester, year)

The current status of those tables are shown below.

Course

<u>cid</u>	title	credits
CSE101	Discrete Mathematics	3
CSE102	Computer Prog. I	3
CSE103	Computer Prog. II	3
EEE101	Electrical Circuits I	4
EEE102	Electrical Circuits II	4

Section

<u>cid</u>	<u>secid</u>	<u>semester</u>	<u>year</u>
CSE101	1	Spring	2018
CSE101	1	Spring	2019
CSE101	2	Fall	2019
CSE102	1	Fall	2018
CSE102	2	Fall	2018
CSE103	1	Spring	2019
CSE103	2	Fall	2019
EEE101	1	Spring	2019
EEE102	1	Spring	2019
EEE102	1	Fall	2019

When the SQL shown below is executed, which of the following tables is obtained as the output?

```
SELECT C.title
FROM Course C
WHERE 1 = (SELECT COUNT(cid)
FROM Section S
WHERE C.cid = S.cid AND S.year = 2019);
```

a)

Title
Null

b)

title
Computer Prog. II
Electrical Circuits I
Electrical Circuits II

c)

title
Discrete Mathematics
Computer Prog. I
Electrical Circuits I
Electrical Circuits II

d)

title
Electrical Circuits I

Q27. Which of the following is an appropriate explanation of an E-R diagram?

- a) A relationship is expressed by describing the related entity name in the entity type.
- b) The relationship between entity types is expressed by an arrow from the referencing side in the direction of the referenced side.
- c) There are no attributes in the entity type, but the relationship type has attributes.
- d) There are several kinds of relationships between entity types such as one-to-many or many-to-many.

Q28. Which of the following is the main purpose of transaction support in a database management system?

- a) To ensure that either all the updates corresponding to a given transaction are made or none of them are made
- b) To ensure that only authorized users can access the database
- c) To help users update data by providing a graphical user interface
- d) To provide an accessible catalog in which descriptions of data items are stored

Q29. Which of the following is an appropriate description of distributed databases?

- a) Access to a database server is shared among a globally distributed userbase so that everyone can access the database.
- b) It is a database that is distributed to all interested researchers and other users worldwide so that everyone can benefit.
- c) It is a NoSQL database instead of a Relational Database Management System (RDBMS).
- d) It stores different parts of a database in different locations, and its processing is distributed across those parts.

Q25. Which of the following is an appropriate explanation of a relational database?

- a) Data is represented as a table, and the tables are linked to one another using the column values of these tables.
- b) Each attribute is represented as a pair of the attribute value and the storage location of the record having that value and used as an index.
- c) The relationship among records is represented by a data structure using links that can represent both tree and network structures.
- d) The relationship among records is represented by a data structure using pointers that are limited to representing a tree structure.

Q26. Which of the following is performed periodically to prevent a decline in the access efficiency of a database?

- a) Backup
- b) Database dump
- c) Reorganization
- d) Rollback

Q27. A student's ID, name, and class ID are recorded in the Student table. Which of the following SQL returns records of all students whose names start with *A*?

- a) `SELECT * FROM Student WHERE name LIKE '%A';`
- b) `SELECT * FROM Student WHERE name LIKE '%A_';`
- c) `SELECT * FROM Student WHERE name LIKE 'A_';`
- d) `SELECT * FROM Student WHERE name LIKE 'A%';`

Q28. Among the search processes for the “Sales” table, which of the following is appropriate to set a hash index rather than a B+ tree index? Here, the column in which the index is set is shown inside $\langle \rangle$.

Sales (form number, sales date, product name, user ID, store number, sales amount)

- a) Searching for sales with a sales amount of 100 dollars or more. $\langle \text{sales amount} \rangle$
- b) Searching for sales with the product name beginning with ‘DB’. $\langle \text{product name} \rangle$
- c) Searching for sales with the sales date as the current month. $\langle \text{sales date} \rangle$
- d) Searching for sales with the user ID as ‘1001’. $\langle \text{user ID} \rangle$

Q29. Which of the following is the appropriate explanation of the key value store that is used in the processing of big data?

- a) It is represented by a two-dimensional table with rows and columns based on the set theory.
- b) It represents the relationship among nodes with the three (3) elements, i.e., “node,” “relationship,” and “property.”
- c) It saves the desired data together with a value that enables this data to be uniquely identified as a pair.
- d) The data for one (1) case is called a “document,” and the data structure of each document is unrestricted and can be changed whenever data is added.

Q25. Which of the following is the key of the relation schema, $R(A, B, C, P, Q, T)$, when R has the functional dependencies shown below?

$$A \rightarrow B$$

$$A \rightarrow C$$

$$CP \rightarrow Q$$

$$CP \rightarrow T$$

a) A

b) A, B

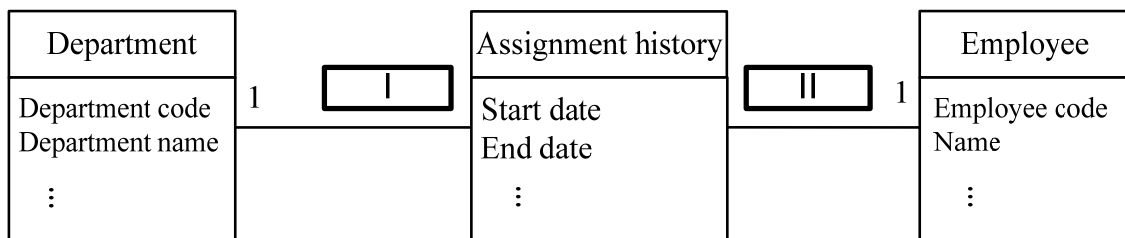
c) A, P

d) C, P

Q27. In the data model of the figure represented by UML, which of the following is a multiplicity that should be inserted in blanks I and II?

[Conditions]

- (1) One or more employees belong to a department.
- (2) An employee belongs to any one department.
- (3) The history of the departments to which an employee has belonged is recorded as the assignment history.



	I	II
a)	0..*	0..*
b)	0..*	1..*
c)	1..*	0..*
d)	1..*	1..*

Q28. When a failure occurs in a storage unit that stores a database, which of the following is an operation that can recover the database by using backup files and a log?

- a) Archive
- b) Checkpoint dump
- c) Commit
- d) Rollforward

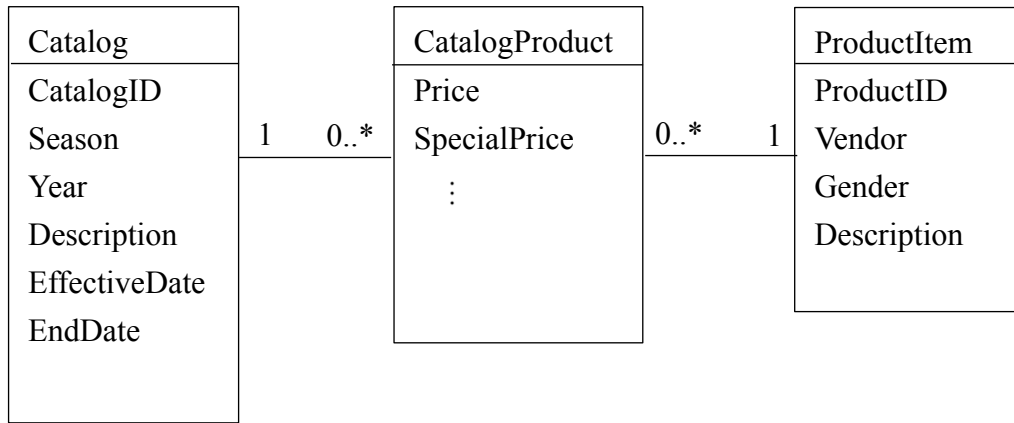
Q29. Which of the following is an appropriate explanation of the granularity of locks?

- a) When a large number of transactions update the same data, and the granularity is set as large, the number of transactions that can be simultaneously executed increases.
- b) When all data in a table are referenced, and the granularity is set as large, data referenced from other transactions can be undisturbed.
- c) When data are updated, and the granularity is set as large, the waiting times of other transactions increase, and the total throughput declines.
- d) When the granularity is set as large, the number of included data increases, and the number of locks that one transaction makes increases.

Q31. Which of the following is a device that connects multiple LANs by relaying data through the protocol information of the data link layer of the OSI basic reference model?

- a) Bridge b) Gateway c) Repeater d) Router

Q26. From the figure below, which of the following is an appropriate set of attributes for the “CatalogProduct” class table?



- a) CatalogID, Price, SpecialPrice
- b) CatalogID, ProductID, Price, SpecialPrice
- c) Price, SpecialPrice
- d) ProductID, Price, SpecialPrice

Q27. Which of the following is the database function that is automatically executed when a specific action such as update, delete, or insert occurs within a database?

- a) Cursor b) Stored procedure c) Trigger d) Update query

Q28. A sequence of two relational algebra expressions is shown below.

$$T_1 \leftarrow \pi_Y(R)$$

$$T \leftarrow T_1 - \pi_Y((S \times T_1) - R)$$

Here, “ π_Y ”, “ \times ”, and “ $-$ ” represent projection, direct product, and difference, respectively. When the relational states of R and S are as follows, which of the following can be obtained as T ?

R	
X	Y
1	A
2	A
2	B

S	
X	
1	
2	

a)

T	
Y	
NULL	

b)

T	
Y	
A	

c)

T	
Y	
B	

d)

T	
Y	
A	
B	

Q29. There are three tables, EMPLOYEE, PROJECT, and WORK_PROJ for recording employees, projects, and working information of employees on projects respectively. When the SQL statement shown below is executed for these tables, which of the following is generated as the output?

EMPLOYEE

EID	ENAME
1	Rahbar
2	Karthik
3	Abir

PROJECT

PID	PNAME
1	Construction
2	Land Purchase

WORK_PROJ

EID	PID	HOURS
1	1	20
1	2	10
2	1	40
3	1	20
3	2	10

[SQL Statement]

```
SELECT ENAME FROM EMPLOYEE
WHERE NOT EXISTS
  ((SELECT PID FROM PROJECT)
  EXCEPT
  (SELECT PID FROM WORK_PROJ
   WHERE WORK_PROJ.EID = EMPLOYEE.EID))
```

a)

ENAME
NULL

b)

ENAME
Rahbar
Karthik

c)

ENAME
Karthik
Abir

d)

ENAME
Rahbar
Abir

Q30. In a database system, which of the following is the action to undo changes done by transactions executed after the last commit?

- a) Commit b) Roll back c) Roll forward d) View

Q25. When an order data shown below is entered, which of the following is the data validation that is performed to determine whether the order date is on or before the business day on which the data is entered?

Order data

Slip No. (characters)	Order date (characters)	Product code (characters)	Quantity (number)	Customer code (characters)
--------------------------	----------------------------	------------------------------	----------------------	-------------------------------

- a) Duplicate check
- b) Format check
- c) Logical check
- d) Sequence check

Q27. Of the functions provided by a DBMS, which of the following is a means for achieving protection for data confidentiality?

- a) Checking referential constraints when the data is updated
- b) Managing a transaction that combines a series of processes as a logical unit
- c) Managing the data access rights of users
- d) Placing an exclusive lock on the data before it is updated

Q28. In a relational database, which of the following is the appropriate purpose for defining a foreign key?

- a) To prevent fragmentation in the record storage area due to the repeated deletion and insertion of records
- b) To provide a constraint to maintain referential consistency between the records of related tables
- c) To restore as many records as possible when they are damaged by failure, based on the mutual relationship between tables
- d) To speed up the searching and updating of related tables by storing them closer together

Q29. Which of the following is an SQL statement that gives the same result as the SQL statement that is described below for the “Product” table and the “Inventory” table? Here, the underlined part indicates the primary key.

```
SELECT ProductNumber FROM Product
WHERE ProductNumber NOT IN (SELECT ProductNumber FROM Inventory)
```

Product

<u>ProductNumber</u>	ProductName	UnitPrice
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Inventory

<u>WarehouseNumber</u>	<u>ProductNumber</u>	InventoryQuantity
------------------------	----------------------	-------------------

- a) SELECT ProductNumber FROM Product
WHERE EXISTS (SELECT ProductNumber FROM Product)
- b) SELECT ProductNumber FROM Inventory
WHERE NOT EXISTS (SELECT ProductNumber FROM Product)
- c) SELECT ProductNumber FROM Product
WHERE EXISTS (SELECT ProductNumber FROM Inventory
WHERE Product.ProductNumber = Inventory.ProductNumber)
- d) SELECT ProductNumber FROM Product
WHERE NOT EXISTS (SELECT ProductNumber FROM Inventory
WHERE Product.ProductNumber = Inventory.ProductNumber)

Q30. Which of the following is a file where values before and after an update of the database are written and saved as the update history of the database?

- a) Backup file
- b) Checkpoint file
- c) Dump file
- d) Log file

Q31. Which of the following is an appropriate description of the lock operation that is used for the concurrency control of a transaction?

- a) For a resource on which a shared lock is acquired, the acquisition of a new shared lock by another transaction is permitted.
- b) For a resource on which a shared lock is acquired, the acquisition of a new exclusive lock by another transaction is permitted.
- c) For a resource on which an exclusive lock is acquired, the acquisition of a new shared lock by another transaction is permitted.
- d) For a resource on which an exclusive lock is acquired, the acquisition of a new exclusive lock by another transaction is permitted.

Q26. An employee works for a department, which can be located in multiple regions. Three tables EMP, DEPT, and DEPT_LOCS are created as shown below for recording the employee, department, and department location data, respectively.

EMP

EID	Ename	DNO	Salary
11	John Bate	1	20000
12	Mohammed Karim	2	40000
13	Sadat Hossain	1	50000
14	Katherine Li	3	20000
15	Shuvashish Bose	3	40000

DEPT

DNO	Dname	Manager ID
1	Admin	11
2	Accounts	13
3	Research	15

DEPT_LOCS

DNO	Region
1	L1
1	L3
2	L2
3	L3
3	L2

What is the output of the SQL shown below?

```
SELECT EName, Salary
FROM EMP
WHERE DNO IN (( SELECT DNO
                  FROM DEPT)
              MINUS
              (SELECT DNO
               FROM DEPT_LOCS
               WHERE Region=' L2' )
              ))
```

a)

Ename	Salary
NULL	NULL

b)

Ename	Salary
John Bate	20000
Sadat Hossain	50000

c)

Ename	Salary
John Bate	20000
Sadat Hossain	50000
Katherine Li	20000
Shuvashish Bose	40000

d)

Ename	Salary
John Bate	20000
Mohammed Karim	40000
Sadat Hossain	50000
Katherine Li	20000
Shuvashish Bose	40000

Q27. In an SQL statement, which of the following is a constraint that is specified with FOREIGN KEY and REFERENCES?

- a) Assertion
- b) Check constraint
- c) Key constraint
- d) Referential constraint

Q28. In a client/server system, which of the following is the mechanism that reduces the network load between the client and server by placing the frequently used commands on the DBMS on the server in advance?

- a) Group commitment
- b) Multithreading of server processes
- c) Stored procedure
- d) Two-phase commitment

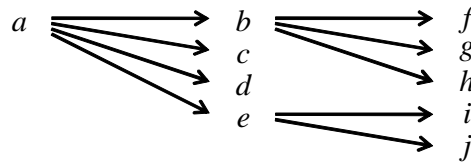
Q29. Which of the following is a characteristic to guarantee that the result of an update transaction is either performed completely or canceled as if nothing happened?

- a) Atomicity
- b) Consistency
- c) Durability
- d) Isolation

Q30. Which of the following is the process that is executed periodically to prevent reducing the access efficiency of the database?

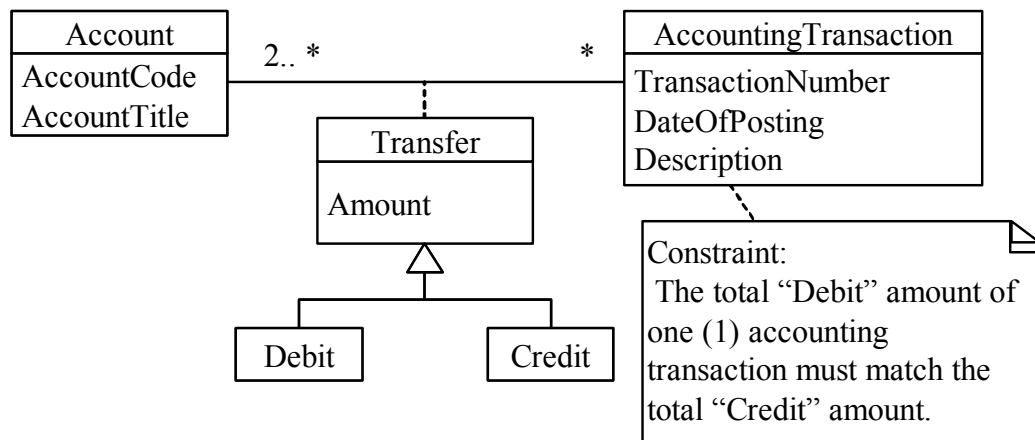
- a) Backup
- b) Database dump
- c) Reorganization
- d) Roll back

Q27. “ $a \rightarrow b$ ” represents the fact that when the value of attribute a is determined, the value of attribute b is determined uniquely. For example, “Employee number \rightarrow Employee name” represents that when the employee number is determined, the employee name is determined uniquely. Based on this notation, when the relations between attributes a through j are established as shown in the figure below, which of the following is an appropriate combination of three (3) tables that defines the relations in a relational database?



- | | |
|---|---|
| <p>a) Table 1 (a)
Table 2 (b, c, d, e)
Table 3 (f, g, h, i, j)</p> | <p>b) Table 1 (a, b, c, d, e)
Table 2 (b, f, g, h)
Table 3 (e, i, j)</p> |
| <p>c) Table 1 (a, b, f, g, h)
Table 2 (c, d)
Table 3 (e, i, j)</p> | <p>d) Table 1 (a, c, d)
Table 2 (b, f, g, h)
Table 3 (e, i, j)</p> |

Q28. The data model in the diagram below is implemented with three (3) tables. Which of the following is an appropriate combination of *A* and *B* in table “Transfer” that contains the record that indicates “500 dollars sales to Company X are posted to the cash account on April 4, 2017”? Here, the data model is described in UML.



Account

Account Code	AccountTitle
208	Sales
510	Cash
511	Deposits
812	Travel expenses

Transfer

Account Code	Debit/Credit	Amount	Transaction Number
A	B	500	0122
208	Credit	500	0122
510	Credit	500	0124
812	Debit	500	0124

AccountingTransaction

TransactionNumber	DateOfPosting	Description
0122	2017-04-04	Company X
0124	2017-04-04	Company X

	<i>A</i>	<i>B</i>
a)	208	Credit
b)	208	Debit
c)	510	Credit
d)	510	Debit

Q29. After relations X and Y are joined, which of the following is (are) the relational algebra operation(s) to obtain relation Z ?

X

StudentNumber	Name	FacultyCode
1	Amy White	A
2	Bob Green	B
3	Cathy Black	A
4	David Grey	B
5	Edward Brown	A
6	Frank Blue	A

Y

FacultyCode	FacultyName
A	Engineering
B	Information
C	Literature

Z

FacultyName	StudentNumber	Name
Information	2	Bob Green
Information	4	David Grey

- a) Projection and selection
- b) Projection and union
- c) Selection
- d) Selection and union

Q30. In a DBMS, when multiple transaction programs update the same database simultaneously, which of the following is a technology that is used to prevent logical contradictions?

- a) Exclusive control
- b) Integrity constraint
- c) Normalization
- d) Reorganization

Q31. As an example of the use of big data, which of the following is a process that uses statistical or other methods to obtain new knowledge (such as trends and patterns) from a large amount of data?

- a) Data dictionary
- b) Data mining
- c) Data warehouse
- d) Metadata

Q24. When ordering data in the format below is entered, which of the following is an appropriate check to examine whether the value of the *Order date* field is on a business day equal to or prior to the entering date?

Ordering data

Form number (Characters)	Order date (Characters)	Product code (Characters)	Quantity (Numbers)	Customer code (Characters)
-----------------------------	----------------------------	------------------------------	-----------------------	-------------------------------

- a) Sequence check
- b) Duplication check
- c) Format check
- d) Logical check

Q26. Which of the following properties of database transactions refers to the ability of the system to recover a committed transaction when either the system or the storage media fails?

- a) Atomicity
- b) Consistency
- c) Durability
- d) Isolation

Q27. There is a “Delivery” table that has six (6) records. Which of the following is the functional dependency that is satisfied by this table? Here, “ $X \rightarrow Y$ ” indicates that X functionally determines Y .

Delivery

Delivery_ date	Department_ ID	Department_ name	Delivery_ destination	Component_ ID	Quantity
2016-08-21	300	Production department 2	Chicago office	1342	300
2016-08-21	300	Production department 2	Chicago office	1342	300
2016-08-25	400	Production department 1	Boston factory	2346	300
2016-08-25	400	Production department 1	Boston factory	2346	1,000
2016-08-30	500	Research and development department	Boston factory	2346	30
2016-08-30	500	Research and development department	New York office	1342	30

- a) Delivery_date \rightarrow Component_ID
- b) Delivery_destination \rightarrow Component_ID
- c) Department_ID \rightarrow Component_ID
- d) Department_name \rightarrow Delivery_destination

Q28. Which of the following methods to join two (2) tables in an RDBMS is a description of the sort-merge join method?

- a) All rows in the tables are re-ordered according to the values in the column to be joined, and they are joined in order from the top.
- b) If a column to be joined in one of the tables is included in the index, the column to be joined in the other table and the index value are used to join the tables.
- c) The values in a column to be joined in one of the tables are extracted in order, and they are joined with the column to be joined from the other table.
- d) The values in a column to be joined in one of the tables are used to create a hash table, and this is joined with the column to be joined from the other table.

Q29. When the SQL statement shown below is executed on the “Employee” table and the “Department” table, which of the following is the result?

```
SELECT COUNT(*) FROM Employee, Department
WHERE Employee.Department = Department.Department_name AND
Department.Floor = 2
```

Employee_number	Department
11001	Administration
11002	Accounting
11003	Sales
11004	Sales
11005	Information systems
11006	Sales
11007	Planning
12001	Sales
12002	Information systems

Department_name	Floor
Planning	1
Administration	1
Information systems	2
Sales	3
Accounting	2
Legal affairs	2
Procurement	2

- a) 1 b) 2 c) 3 d) 4

Q30. In a distributed database system, which of the following is a method for the finalization of update processing when an inquiry is made to multiple sites that perform a series of transaction processes as to whether finalization is possible or not and whether finalization is possible at all sites?

- a) Exclusive control
- b) Roll back
- c) Roll forward
- d) Two-phase commitment

Q25. In a DBMS, which of the following functions decides the schema?

- | | |
|------------------------|-------------------------|
| a) Definition function | b) Maintenance function |
| c) Recovery function | d) Security function |

Q26. The attributes of the relation “OrderRecord” have the functional dependency (1) to (6) below. Normalization is performed with these functional dependencies up to the third normal form, and the decomposition into the relations “Product,” “Customer,” “Order,” and “OrderDetails” are performed. Which of the following is appropriate for the relation “OrderDetails”? Here, $\{X, Y\}$ represents a combination of the attributes X and Y , and $X \rightarrow Y$ represents that X functionally determines Y . The solid underline represents a primary key.

OrderRecord (OrderNumber, OrderDate, CustomerNumber, CustomerName,
ProductNumber, ProductName, Quantity, UnitSalesPrice)

[Functional dependency]

- (1) OrderNumber, \rightarrow OrderDate
- (2) OrderNumber, \rightarrow CustomerNumber
- (3) CustomerNumber \rightarrow CustomerName
- (4) {OrderNumber, ProductNumber} \rightarrow Quantity
- (5) {OrderNumber, ProductNumber} \rightarrow UnitSalesPrice
- (6) ProductNumber \rightarrow ProductName

- a) OrderDetails (OrderNumber, Quantity, UnitSalesPrice)
- b) OrderDetails (OrderNumber, CustomerNumber, Quantity, UnitSalesPrice)
- c) OrderDetails (OrderNumber, CustomerNumber, ProductNumber, CustomerName, Quantity, UnitSalesPrice)
- d) OrderDetails (OrderNumber, ProductNumber, Quantity, UnitSalesPrice)

Q27. Which of the following is an appropriate description of the mapping between the relational model and relational database as its implementation?

- a) A domain is mapped to a character type or a character string type.
- b) A relation is mapped to a table.
- c) Attributes and columns are ordered from left to right.
- d) Neither tuples nor rows have duplicates.

Q29. Which of the following can change the deadlock state of the transaction back to the normal state?

- a) Commit
- b) Drop
- c) Rollback
- d) Roll Forward

Q21. ABC company applies a three-generation backup policy. The ABC company's system automatically performs full back up on the 10th, 17th, and 25th of each month. If the latest back up was performed on 17th September, what is the date that the oldest information was backed up?

- a) 17th August b) 25th August c) 10th September d) 17th September

Q27. Which of the following is a database design that consists of multiple tables, with rows and columns that are linked together through matching data stored in each table?

- a) Hierarchical database
- b) Network database
- c) Object-oriented database
- d) Relational database

Q28. Which of the following is an appropriate explanation of schema in RDBMS?

- a) It is a collective term for database operations, such as insert, update, deletion, and selection of data.
- b) It is a collective term for various constraints for maintaining consistency of the database.
- c) It is a set of data definitions, such as the nature of data, the format of data, and the relation with other data.
- d) It is not a real table, but a virtual table from the users' viewpoint.

Q29. Which of the following is an appropriate normalization form (NF) used in a relational database in which every non-prime attribute must be dependent only on the primary key, and no non-prime attribute is dependent on another non-prime attribute?

- a) 1NF b) 2NF c) 3NF d) BCNF

Q30. Among the phases of database design, which of the following phases involves the creation of an ER diagram?

- a) Conceptual design of databases phase
- b) Distributed design of databases phase
- c) Logical design of databases phase
- d) Physical design of databases phase

Q31. Which of the following SQL statements for the table “ShipmentRecord” obtains the largest value?

ShipmentRecord

ProductNumber	Date	Quantity
NP200	2015-10-10	3
FP233	2015-10-10	2
NP200	2015-10-11	1
FP233	2015-10-11	2

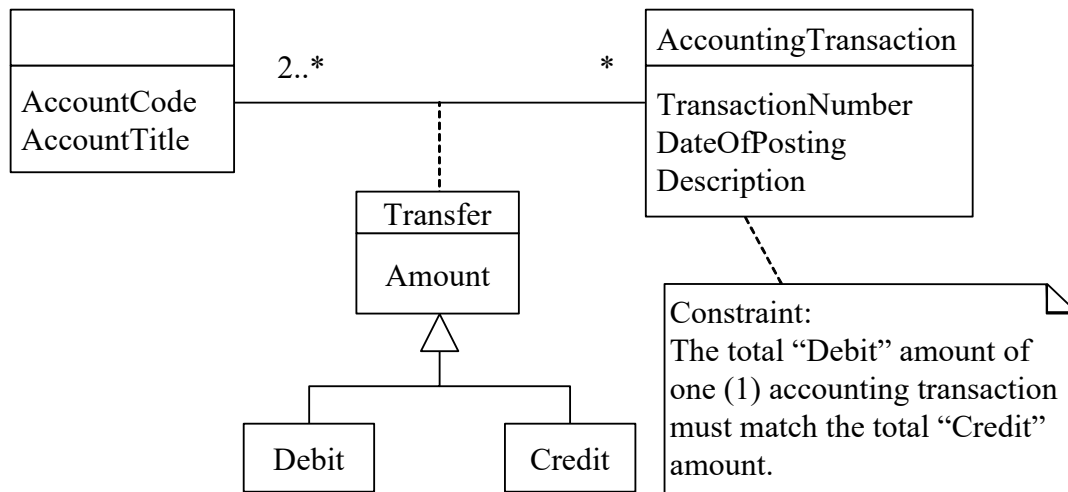
- a) `SELECT AVG(Quantity) FROM ShipmentRecord WHERE ProductNumber = 'NP200'`
- b) `SELECT COUNT(*) FROM ShipmentRecord`
- c) `SELECT MAX(Quantity) FROM ShipmentRecord`
- d) `SELECT SUM(Quantity) FROM ShipmentRecord WHERE Date = '2015-10-11'`

Q26. When new naming conventions for data items are provided, which of the following problems cannot be avoided only by the naming conventions described below?

[Naming conventions]

- (1) Always add a classification word such as the “name”, “code”, “number”, “amount”, or “date” at the end of the data item name, and set the data type determined for each classification word.
 - (2) Create a dictionary in which data item names and their meanings are registered, and ensure that synonyms and homonyms do not occur.
-
- a) Both the date type and the character string exist together as the data type of the data item “ReceiptDate”.
 - b) It cannot be determined whether the data item “Customer” is the “CustomerCode” or “CustomerName”.
 - c) The scope of the possible values of the data item “OrderAmount” varies according to the table.
 - d) There is a data item called “AwardAmount” that has the same meaning as the data item “BonusAmount”.

Q27. The data model shown in the figure below is implemented as three (3) tables. At this time, which of the following is an appropriate combination of *A* and *B* in the “Transfer” table in which the transaction of “the sales of 500 dollars to Company *C* are booked in the cash account on April 4, 2015” is recorded? Here, the data model is described in UML.



Account

Account Code	Account Title
208	Sales
510	Cash
511	Deposits
812	Travel expenses

Transfer

Account Code	Debit/ Credit	Amount	Transaction Number
<i>A</i>	<i>B</i>	500	0122
208	Credit	500	0122
510	Credit	500	0124
812	Debit	500	0124

Accounting transaction

Transaction Number	DateOf Posting	Description
0122	2015-04-04	Company A
0124	2015-04-04	Company A

	<i>A</i>	<i>B</i>
a)	208	Credit
b)	208	Debit
c)	510	Credit
d)	510	Debit

Q28. In the process of table implementation, which of the following is an appropriate SQL statement that removes a column in an existing table?

- | | |
|---|---|
| a) ALTER TABLE table_name
DELETE COLUMN column_name | b) ALTER TABLE table_name
DROP COLUMN column_name |
| c) UPDATE TABLE table_name
DELETE COLUMN column_name | d) UPDATE TABLE table_name
DROP COLUMN column_name |

Q29. When a manager is analyzing the sales of products in a supermarket, he makes a query to list all products with their sales amount, including the products that have no sales amount. Which of the following is an appropriate combination of statements to be filled in the boxes in the query? Here, the columns of Product and Sales are shown below.

Product: (ProductID, PName, Price, Cost)

Sales: (SalesID, ProductID, SalesDate, Unit, Amount)

```
SELECT Product.PName, SUM(Amount)
FROM Product  Sales
on Product.ProductID = Sales.ProductID
GROUP BY ;
```

	(A)	(B)
a)	INNER JOIN	Amount
b)	INNER JOIN	Product.PName
c)	LEFT JOIN	Amount
d)	LEFT JOIN	Product.PName

Q30. Which of the following is an appropriate description of locks?

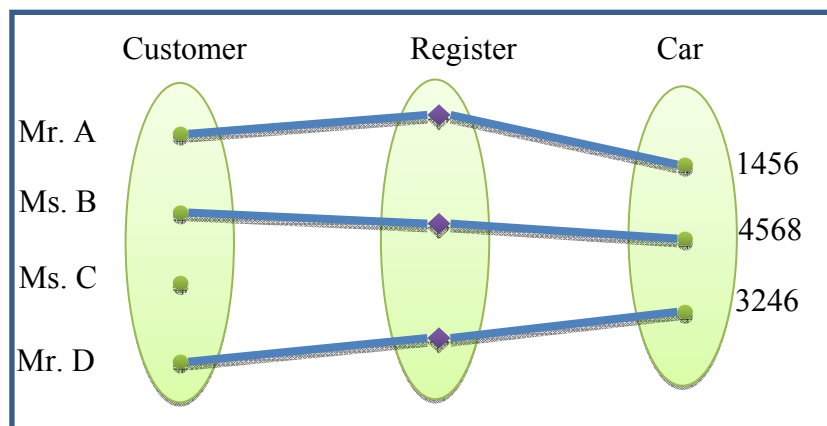
- a) For a resource on which transaction T1 has acquired an exclusive lock, transaction T2 can acquire an exclusive, but not a shared, lock.
- b) For a resource on which transaction T1 has acquired an exclusive lock, transaction T2 can acquire either an exclusive or a shared lock.
- c) For a resource on which transaction T1 has acquired a shared lock, transaction T2 can acquire a shared, but not an exclusive, lock.
- d) For a resource on which transaction T1 has acquired a shared lock, transaction T2 can acquire either a shared or an exclusive lock.

- Q20.** A company performs a full backup every Sunday night and differential backups every night other than Sunday night. If the failure occurs on Wednesday morning, which of the following backups is least needed to restore the system?
- a) The latest differential backups from Tuesday.
 - b) The latest full and the latest differential backups from both Monday and Tuesday.
 - c) The latest full and the latest differential backups from Tuesday.
 - d) The latest full backups from Sunday.

Q29. Which of the following is an appropriate purpose for adopting a three-layer schema architecture for DBMS?

- a) To avoid making any impact on an application program even if the physical storage structure of data is changed
- b) To derive a new table from a source table through a relational operation as if the new table actually existed
- c) To restrict programming languages such that the application program and DBMS are linked closely
- d) To use an interactively used SQL statement from an application program as well

Q30. Which is the most suitable multiplicity of the “Register” relationship between “Customer” entity and “Car” entity that matches the following diagram? Here, “A..B” and “C..D” respectively indicate the minimum and maximum possible participations to the relationship.



	A	B	C	D
a)	0	1	0	1
b)	1	1	0	1
c)	0	1	0	*
d)	1	1	0	*

Q31. Which of the following is an appropriate method used to remove data redundancy in relational database systems?

- a) Entity-relationship
- b) Functional dependency
- c) Hierarchical
- d) Normalization

Q32. In a relation schema $R = (A, B, C, D, E)$, the following functional dependencies are held:

$$A \rightarrow BC$$

$$CD \rightarrow E$$

$$B \rightarrow D$$

$$E \rightarrow A$$

Which of the following is a combination of two candidate keys for R ?

a) A and E

b) B and C

c) B and D

d) C and D

Q33. Which of the following is the main purpose of transaction support in a database management system?

- a) To ensure that either all the updates corresponding to a given transaction are made or none of them is made
- b) To ensure that only authorized users can access the database
- c) To help users update data by providing a graphical user interface
- d) To provide an accessible catalog in which descriptions of data items are stored

Q26. Among the descriptions concerning database models, which of the following is an appropriate explanation of the network model?

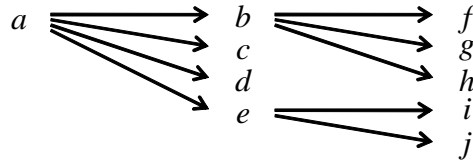
- a) It consists of two or more data files located at different sites on a computer network.
- b) It presents information in two-dimensional tables with rows and columns.
- c) Its records are organized into a tree structure.
- d) Its records can have multiple parent records and multiple child records.

Q27. When the relationships between continent and country and between country and city are shown in the class diagram below, which of the following is an appropriate combination of multiplicities that are to be inserted into blank *A* through blank *D*? Here, there is no cross continental country. Each continent has at least one country, and each country has at least one city.



	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
a)	1..1	1..*	1..*	1..1
b)	1..1	1..*	1..1	1..*
c)	1..1	0..*	0..*	1..1
d)	1..1	0..*	1..1	0..*

Q28. “ $a \rightarrow b$ ” represents the fact that when the value of item a is determined, the value of item b is determined uniquely. For example, “Employee number \rightarrow Employee name” represents that when the employee number is determined, the employee name is determined uniquely. Based on this notation, when the relations between items a through j are established as shown in the figure below, which of the following is the appropriate combination of three tables that defines the relations in the relational database?



- | | |
|---|---|
| a) Table 1 (a)
Table 2 (b, c, d, e)
Table 3 (f, g, h, i, j) | b) Table 1 (a, b, c, d, e)
Table 2 (b, f, g, h)
Table 3 (e, i, j) |
| c) Table 1 (a, b, f, g, h)
Table 2 (c, d)
Table 3 (e, i, j) | d) Table 1 (a, c, d)
Table 2 (b, f, g, h)
Table 3 (e, i, j) |

Q29. In the operation of a relational database, which of the following is an appropriate explanation of projection?

- a) From two or more sets of tables, the sets that match conditions are combined together to create a new table.
- b) Only specific columns are extracted from a table.
- c) The query result of a table and the query result of another table are combined together and set in one table.
- d) The rows that match specific conditions are extracted from a table.

Q30. Which of the following is an SQL statement that gives the same result as the SQL statement that is described below for the “Product” table and the “Inventory” table? Here, the underlined part indicates the primary key.

```
SELECT ProductNumber FROM Product
WHERE ProductNumber NOT IN (SELECT ProductNumber FROM Inventory)
```

Product

<u>ProductNumber</u>	ProductName	UnitPrice
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Inventory

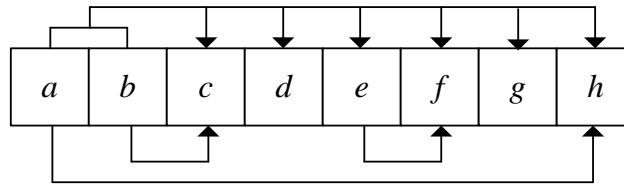
<u>WarehouseNumber</u>	<u>ProductNumber</u>	InventortQuantity
------------------------	----------------------	-------------------

- a) SELECT ProductNumber FROM Product
WHERE EXISTS (SELECT ProductNumber FROM Product)
- b) SELECT ProductNumber FROM Inventory
WHERE NOT EXISTS (SELECT ProductNumber FROM Product)
- c) SELECT ProductNumber FROM Product
WHERE EXISTS (SELECT ProductNumber FROM Inventory
WHERE Product.ProductNumber = Inventory.ProductNumber)
- d) SELECT ProductNumber FROM Product
WHERE NOT EXISTS (SELECT ProductNumber FROM Inventory
WHERE Product.ProductNumber = Inventory.ProductNumber)

Q28. In a relational database table, which of the following is a column or a combination of columns whose values are defined by the primary key of another table in order to maintain referential integrity in the database?

- a) Candidate key
- b) Foreign key
- c) Super key
- d) Surrogate key

Q29. There is a record that consists of eight attributes a through h as shown below. The primary key of the record is the combination of attributes a and b . Attributes h , c , and f can be determined by attributes a , b , and e respectively. Which of the following is the third normal form of this record?



- a)

a	h
-----	-----

b	c
-----	-----

a	b	c	d	e	f	g
-----	-----	-----	-----	-----	-----	-----
- b)

a	h
-----	-----

b	c
-----	-----

a	b	d	e	f	g
-----	-----	-----	-----	-----	-----
- c)

a	h
-----	-----

b	c
-----	-----

e	f
-----	-----

a	b	d	e	g
-----	-----	-----	-----	-----
- d)

a	b	c	d	e	f	g	h
-----	-----	-----	-----	-----	-----	-----	-----

Q30. Which of the following is an appropriate description of the ACID (Atomicity, Consistency, Isolation, and Durability) properties that are considered to be the key transaction processing features of a database management system (DBMS)?

- a) Atomicity refers to the ability of the application to make operations in a transaction appear isolated from all other operations.
- b) Consistency refers to the ability of the DBMS to guarantee that either all of the tasks of a transaction are performed or none of them are.
- c) Durability refers to the guarantee that once the user has been notified of success, the transaction persists, and is not undone.
- d) Isolation refers to the database being in a legal state when the transaction begins and when it ends.

Q31. When there are two relational database tables A and B as shown below, which of the following is the appropriate table that shows the result of the relational operation $A \div B$?

A		B	
Employee_ID	Project_ID	Project_ID	
S1	P1	P2	
S1	P2	P4	
S1	P3		
S1	P4		
S2	P1		
S2	P2		
S3	P2		
S4	P2		
S4	P4		

- a)

Employee_ID
S1
S2
- b)

Employee_ID
S1
S4
- c)

Employee_ID
S1
S2
S3
S4
- d)

Employee_ID
S3
S4

Q32. For the “Product” table shown below, a transaction that executes the SQL statement below terminates abnormally because of the occurrence of a deadlock. Which of the following is the “Product” table after the abnormal termination? Here, other transactions use the “Product” table as reference but do not update it.

Product

Product_code	Product_name	Unit_price
A010	AAA	2,500
B020	BBB	1,000
C030	CCC	4,500

[SQL statement]

DELETE FROM Product WHERE Product_code = ' B020'

a)

Product_code	Product_name	Unit_price
A010	AAA	2,500
B020	NULL	1,000
C030	CCC	4,500

b)

Product_code	Product_name	Unit_price
A010	AAA	2,500
B020	BBB	1,000
C030	CCC	4,500

c)

Product_code	Product_name	Unit_price
A010	AAA	2,500
C030	CCC	4,500

d)

Product_code	Product_name	Unit_price
B020	BBB	1,000

Q15. The response speed of a database server is slowed down, even though no application is changed. As shown in the table below, the possible causes and the investigation items are considered to identify the cause. Which of the following is an appropriate investigation item that should be inserted in blank *C*?

Possible cause	Investigation item
<ul style="list-style-type: none">• An increase in load because of the coexistence of another system on the same machine• An increase in the amount of communication because of an increase in the number of connected clients	<i>A</i>
<ul style="list-style-type: none">• The generation of SQL statements that require a large processing time because of atypical searches	<i>B</i>
<ul style="list-style-type: none">• An increase in disk I/O because of fragmentation	<i>C</i>
<ul style="list-style-type: none">• A lack of buffer capacity in the database	<i>D</i>

- a) Confirmation of changes in external factors
- b) Identification of slow processes
- c) Investigation of the hit ratio of cache memory
- d) Verification of the status of data storage

Q26. Which of the following is an appropriate explanation concerning the data structure in a relational database?

- a) Data and methods are unified (i.e., encapsulated) and stored.
- b) Data is represented with one or more two-dimensional tables.
- c) Parent records and child records are linked with a pointer.
- d) Tags are used to represent data structure and meaning.

Q27. In a relational database, there are two conditions that must be met as a primary key constraint. One condition is that there are no duplicate key values. Which of the following is another condition?

- a) The primary key must be composed of only one column.
- b) The primary key must be defined as the first column of a table.
- c) The primary key value must match the candidate key of another table.
- d) The primary key value must not be null.

Q28. In order to find all rows from the “Books” table that include “UNIX” in the title, the SQL statement is used as shown below. Which of the following is an appropriate character string that is specified in blank A? Here, the title is stored in the “Title” column of the “Books” table.

SELECT * FROM Books WHERE Title LIKE ' A '

- a) %UNIX b) %UNIX% c) UNIX d) UNIX%

Q29. Which of the following is the relational operation that corresponds to the manipulation of the SQL statement for Table R shown below?

R

A1	A2	A3	A4	A5
----	----	----	----	----

[SQL statement]

SELECT A1, A3, A5 **FROM** R

- a) Difference
- b) Join
- c) Projection
- d) Selection

Q30. When the SQL statement below is executed under the given conditions, what is the maximum number of rows that are created?

```
SELECT  P. ProductID, P. ProductName, S. SalesAmount
FROM    Product P LEFT JOIN Sales S
ON      S. ProductID = P. ProductID
```

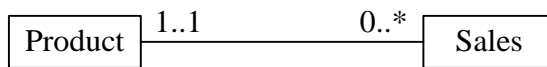
[Conditions]

1. There are two relational database tables “Product” and “Sales” as shown below.

Product: ProductID, ProductName, UnitPrice

Sales: ProductID, SalesQuantity, SalesAmount

The relationship between “Product” and “Sales” is illustrated by using a UML class diagram as shown below.



2. There are 2,000 rows in the “Product” table and 100,000 rows in the “Sales” table.

- a) 2,000 b) 100,000 c) 101,999 d) 200,000,000

Q18. In a client/server system using a database server, the generation of a large number of SQL statements causes a problem with a rapidly increasing network load between client and server. Which of the following is an appropriate solution to this problem?

- a) Reorganization of database
- b) Revision of index
- c) Use of dynamic SQL
- d) Use of stored procedure

Q32. Which of the following is the appropriate sequence of steps used for normalizing a relational database table?

Step A: Attributes dependent on non-key attributes are separated as another table.

Step B: Attributes dependent on only part of key are separated as another table.

Step C: Repetitive data is separated as another table.

a) $B \rightarrow A \rightarrow C$

b) $B \rightarrow C \rightarrow A$

c) $C \rightarrow A \rightarrow B$

d) $C \rightarrow B \rightarrow A$

Q33. In a relational database, which of the following is an appropriate definition of a composite key?

- a) A minimal set of attributes that uniquely identifies a tuple within a relation
- b) A primary or foreign key that consists of two or more attributes of a relation
- c) A set of attributes from which the primary key of a relation is chosen
- d) An attribute in a child table that matches the primary key values in the parent table

Q34. When the SQL statements shown below are executed for the “SMARK” table, which of the following is the appropriate table that can be obtained as a result?

```
CREATE VIEW Result
AS SELECT * FROM SMARKS AS S
WHERE S.Marks > 52 AND S.ID <= 0100
SELECT r.ID FROM Result AS r
WHERE r.Status LIKE 'Pass' AND r.Mark <= 90
```

SMARK

ID	Name	Marks	Status
0014	Jack Smith	80	Pass
0016	Mary White	75	Pass
0057	Tom Scott	90	Pass
0058	Jimmy Brown	52	Fail
0076	Susan Jackson	59	Fail
0100	Bob Miller	92	Pass

a)

ID
0014
0016
0057

b)

ID
0014
0016
0057
0076
0100

c)

ID
0014
0016
0057
0100

d)

ID
0058
0076

Q35. In an SQL statement, which of the following is an appropriate explanation of the percent symbol (%) that is used with the LIKE operator in a WHERE clause?

- a) It is a wildcard character that matches any single alphabetic character.
- b) It is a wildcard character that matches any single character within the list.
- c) It is a wildcard character that matches any single numeric character.
- d) It is a wildcard character that matches any string of zero or more characters.

Q36. As shown below, there are three relational database tables Table_1, Table_2, and Table_3. Table_1 contains the students who have knowledge of Java language, and Table_2 contains the students who have knowledge of C++. Table_3 contains the students who know C++ but do not know Java. Which of the following is the appropriate operation in relational algebra that can be used to create Table_3?

Table_1

Student_ID	Student_Name	Class
S0005	Susan Boyle	C1
S0010	Billy Robinson	C2
S0015	George Miller	C3

Table_2

Student_ID	Student_Name	Class
S0015	George Miller	C3
S0020	Mary Porter	C1
S0010	Billy Robinson	C2
S0001	Adam Smith	C2

Table_3

Student_ID	Student_Name	Class
S0020	Mary Porter	C1
S0001	Adam Smith	C2

- a) Difference b) Intersection c) Natural join d) Union

Q32. Which of the following is the form of normalization into which the relational database table below is classified?

Employee number	Employee name	Year of employment	Position	Position allowance
12345	John Smith	1981	Manager	900
12346	Tom Stewart	1995	Assistant manager	500
12347	Paul Douglas	1997	Assistant manager	500

- a) Second normal form
- b) Third normal form
- c) Fourth normal form
- d) Unnormalized form

Q33. In a relational database, which of the following is an appropriate purpose of defining a foreign key?

- a) To prevent fragmentation of the record storage area because of the repeated deletion and addition of records
- b) To provide a constraint to maintain referential consistency between the records of related tables
- c) To restore as many records as possible that are damaged by a failure, based on the mutual relationship between tables
- d) To speed up the searching and updating of related tables by storing them closer together

Q34. The sales record for salespersons in a certain financial year at a company is shown in the table below. Which of the following is an appropriate SQL statement that retrieves the name of the salesperson with average sales of \$400,000 or higher for the year from the 1st quarter (1Q) through the 4th quarter (4Q) and \$300,000 or higher in sales for each individual quarter? Here, the unit for the amounts in this table is 1,000 dollars.

Sales_record

Number	Name	1Q	2Q	3Q	4Q
123	Ichiro Yamada	296	319	366	415
594	Taro Suzuki	435	453	304	464
612	Hanako Sato	496	394	423	511
⋮	⋮	⋮	⋮	⋮	⋮

- a) SELECT Name FROM Sales_record
WHERE (1Q+ 2Q+ 3Q+ 4Q)/4 >= 400 OR
1Q >= 300 OR 2Q >= 300 OR
3Q >= 300 OR 4Q >= 300
- b) SELECT Name FROM Sales_record
WHERE (1Q+ 2Q+ 3Q+ 4Q) >= 400 AND
1Q >= 300 AND 2Q >= 300 AND
3Q >= 300 AND 4Q >= 300
- c) SELECT Name FROM Sales_record
WHERE 1Q > 400 OR 2Q > 400 OR
3Q >= 400 OR 4Q >= 400 AND
1Q >= 300 OR 2Q >= 300 OR
3Q >= 300 OR 4Q >= 300
- d) SELECT Name FROM Sales_record
WHERE (1Q+ 2Q+ 3Q+ 4Q) >= 1600 AND
1Q >= 300 AND 2Q >= 300 AND
3Q >= 300 AND 4Q >= 300

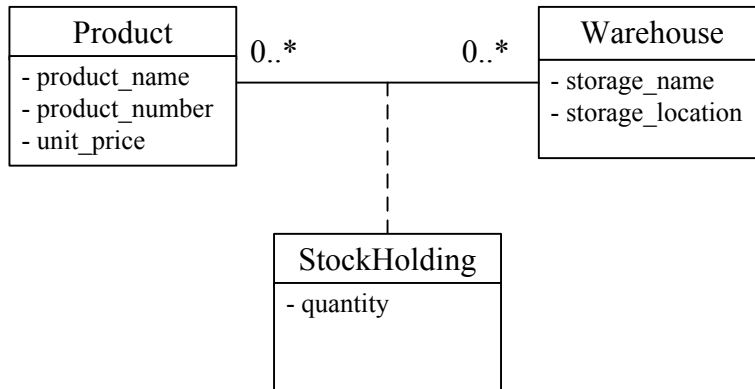
Q35. Which of the following is the unit of atomicity that a DBMS must guarantee for the update of a database?

- a) From a checkpoint to the next checkpoint
- b) From the acquisition of backup data to the occurrence of a media failure
- c) From the start of a transaction to its commit or rollback operation
- d) From the start-up to the shutdown of the database system

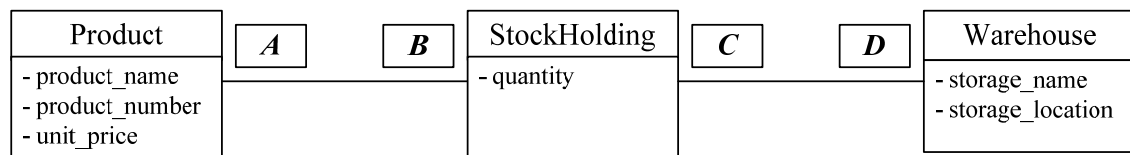
Q36. Which of the following is an appropriate explanation of data warehouse?

- a) A logically interrelated collection of shared data that is physically distributed over a computer network
- b) A subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management's decision-making process
- c) The dynamic synthesis, analysis, and consolidation of large volumes of multi-dimensional data
- d) The process of finding correlations or patterns among dozens of fields in large existing databases by using statistical methods

Q31. As shown in the class diagram below, there is a many-to-many association between the two classes Product and Warehouse. When there is a need to know how many of each product are stored in each warehouse, the association class StockHolding can be added between the two classes Product and Warehouse so as not to hide the original many-to-many relationship.



If the class diagram shown below is depicted using a full class instead of the association class, which of the following is the appropriate combination of cardinalities that are inserted into blanks *A* through *D*?



	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
a)	0..*	1	0..*	1
b)	0..*	1	1	0..*
c)	1	0..*	0..*	1
d)	1	0..	1	0..*

Q32. As shown below, when the SQL statement is executed on the relational database table “Staff”, which of the following tables is created?

```
SELECT StaffID, BranchID FROM Staff WHERE BranchID = ' B03'
UNION
SELECT StaffID, BranchID FROM Staff WHERE Salary > 5000;
```

Staff

StaffID	Salary	BranchID
S01	2000	B01
S02	4000	B01
S03	3000	B03
S04	8000	B03
S05	3000	B03
S06	4000	B07
S07	6000	B08

a)

StaffID	BranchID
S04	B03

b)

StaffID	BranchID
S03	B03
S04	B03
S05	B03
S07	B08

c)

StaffID	BranchID
S03	B03
S04	B03
S05	B03
S04	B03
S07	B08

d)

StaffID	BranchID
S03	B03
S04	B03
S05	B03
S03	B08
S04	B08
S05	B08
S07	B03
S07	B08

Q33. Which of the following is the appropriate flow of execution of SQL statements?

- a) Code generation → Optimization → Decomposition → Execution
- b) Decomposition → Code generation → Optimization → Execution
- c) Decomposition → Optimization → Code generation → Execution
- d) Optimization → Decomposition → Code generation → Execution

Q34. In a relational database system, which of the following is an appropriate purpose of recording changes in a database file as a journal file?

- a) To determine whether to commit or roll back the database updates
- b) To enable recovery to be undertaken effectively in the event of a failure
- c) To move transaction log records to the database backup files
- d) To support concurrency control of the simultaneous execution of transactions

Q35. Which of the following is the most appropriate description concerning the exclusive control of a DBMS?

- a) Exclusive control is necessary for data that might be updated simultaneously by several people.
- b) Exclusive control is necessary for improving the processing speed of data that is frequently accessed.
- c) Exclusive control is necessary for preventing the occurrence of a deadlock when data is accessed.
- d) In order to improve the processing speed, the range of the data on which exclusive control is performed must be made as wide as possible.

Q31. When the order data shown below is entered into the order entry system, which of the following is a check that is performed to see if the order date is on or before the business day on which the data is entered?

Order data

Slip number (characters)	Order date (characters)	Product code (characters)	Quantity (numeric value)	Customer code (characters)
-----------------------------	----------------------------	------------------------------	-----------------------------	-------------------------------

- a) Duplication check
- b) Format check
- c) Logical check
- d) Sequence check

Q33. A university offers many disciplines. Many students graduate in these disciplines after clearing various courses assigned to each discipline. A student can graduate in only one discipline. Some courses are common to certain disciplines. The university maintains the details of courses, disciplines, and students in a relational database. Which of the following describes an appropriate relationship between discipline, course, and student on the database?

- a) The relationship between course and discipline is one-to-many.
- b) The relationship between course and student is many-to-many.
- c) The relationship between course and student is one-to-many.
- d) The relationship between discipline and student is one-to-one.

Q34. When data in the “Product” table is as shown below, which of the following is an update process that reduces the number of rows in the “Profitable_product” view created using “View definition” below?

Product

Product_code	_name	Model	Sales_price	Purchase_price
S001	<i>T</i>	T2003	150,000	100,000
S003	<i>S</i>	S2003	200	170,000
S005	<i>R</i>	R2003	140,000	80,000

[View definition]

```
CREATE VIEW Profitable_product
AS SELECT * FROM Product
WHERE Sales_price - Purchase_price >= 40000
```

- a) Changing the Purchase_price of the product with a Product_code of S003 to 90,000
- b) Changing the Purchase_price of the product with a Product_code of S005 to 90,000
- c) Changing the Sales_price of the product with a Product_code of S001 to 130,000
- d) Changing the Sales_price of the product with a Product_code of S005 to 130,000

Q35. Each time a student is absent from school, the date is recorded in the relational database table A as shown below. Which of the following is an appropriate SQL statement that can be used to create table B containing all of the students who have been absent from school for two consecutive days? Here, the DateDiff function calculates time periods between two dates. For example, DateDiff('2012-04-11','2012-04-10') returns “1”.

A

StudentID	AbsenceDate
...	...
S01	2012-04-10
S10	2012-04-10
S11	2012-04-10
S10	2012-04-11
S12	2012-04-11
S12	2012-04-12
...	...

B

StudentID
...
S10
S12
...

- a) SELECT DISTINCT A.StudentID
FROM A
WHERE DateDiff(A.AbsenceDate, A.AbsenceDate)=1
- b) SELECT DISTINCT A.StudentID
FROM A, A AS A1
WHERE DateDiff(A.AbsenceDate, A1.AbsenceDate)=1
- c) SELECT DISTINCT A.StudentID
FROM A, A AS A1
WHERE A.StudentID = A1.StudentID AND
DateDiff(A.AbsenceDate, A1.AbsenceDate)=1
- d) SELECT DISTINCT A.StudentID
FROM A, A AS A1
WHERE A.StudentID = A1.StudentID OR
DateDiff(A.AbsenceDate, A1.AbsenceDate)=1

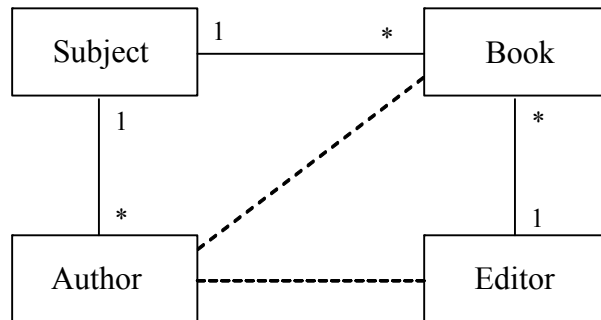
Q36. Which of the following is an appropriate purpose of using a locking mechanism in a relational database system?

- a) To commit or roll back the database updates automatically
- b) To move transaction log records to the database journal files
- c) To support concurrency control of the simultaneous execution of transactions
- d) To write the data periodically from the checkpoint file into the database

Q37. Which of the following is an appropriate explanation of data mining?

- a) A technique for accessing and searching a large amount of data in parallel at very high speed
- b) A technique for accumulating and storing a large amount of time-series data such as sales performance and manufacturing performance
- c) A technique for analyzing a large amount of data statistically and mathematically to discover patterns or rules
- d) A technique for creating separate databases for each department in accordance with the intended use

Q32. A publishing company produces textbooks for high school. Each book is written by an author who specializes in a subject. An editor is assigned to work with an author for a book. An editor can review several books while an author can write several books on the same subject. There are several authors on the same subject and several editors to choose from. The E-R diagram below shows the relationships between subject, author, book, and editor, but the relations between author and book and between author and editor are incomplete. Which of the following is the appropriate combination of relations that are applied to complete the E-R diagram? Here, 1 * indicates a one-to-many relation, * * is a many-to-many relation.



- a)
- b)
- c)
- d)

Q33. When the database design is divided into three phases (i.e., conceptual design, logical design, and physical design), which of the following is a part of the physical design?

- a) Building a model of the data by using the information in user requirements specifications
- b) Checking relational database tables for data redundancy by using normalization procedures
- c) Constructing a model of the data used in an enterprise based on a specific data model (e.g., relational)
- d) Describing base relations, file organizations, and indexes used to improve query performance

Q34. When the table below is used to design a relational database for managing a video-rental shop, which of the following can be a potential candidate key? Here, (X, Y) represents a tuple of attributes X and Y.

CID	CName	SID	SName	VID	RDate	MID	MName
C01	John	S03	Susan	V01	2012-03-20	M01	Harry Potter
C02	Jim	S01	Sara	V03	2012-03-20	M02	Star Wars
C03	Peter	S02	Kim	V03	2012-03-20	M02	Star Wars
C02	Jim	S01	Sara	V02	2012-03-20	M01	Harry Potter
C03	Peter	S02	Kim	V02	2012-03-21	M01	Harry Potter
C02	Jim	S02	Kim	V01	2012-03-20	M01	Harry Potter
C04	Tim	S02	Kim	V02	2012-03-24	M01	Harry Potter

Note: Acronyms and abbreviations are used as shown below.

CID : Customer ID

SID : Staff ID

CName : Customer Name

SName : Staff Name

VID : Video ID

MID : Movie ID

RDate : Rental Date

MName : Movie Name

- a) (CID, MID)
- b) (CID, VID, RDate)
- c) (VID, RDate)
- d) (VID, SID)

Q35. In the term “ACID”, which is the basic foundation that database transactions are built upon, what does the third character “I” stand for?

- a) Independence
- b) Integrity
- c) Interactivity
- d) Isolation

Q36. Which of the following is the UPDATE statement that can correctly update the data of the “Product” table? Here, the “Product” table is defined by the CREATE statement shown below.

```
CREATE TABLE Product
```

```
(Product_number CHAR(4), Product_name CHAR(20), Supplier_number CHAR(6),  
Unit_price INT, PRIMARY KEY(Product_number))
```

Product

Product_number	Product_name	Supplier_number	Unit_price
S001	A	XX0001	180
S002	A	YY0002	200
S003	B	YY0002	350
S004	C	ZZ0003	400
S005	C	XX0001	380

- a) UPDATE Product SET Product_number = 'S001'
WHERE Product_number = 'S002'
- b) UPDATE Product SET Product_number = 'S006'
WHERE Product_name = 'C'
- c) UPDATE Product SET Product_number = NULL
WHERE Product_number = 'S002'
- d) UPDATE Product SET Product_name = 'D'
WHERE Product_number = 'S003'

Q16. In a client/server system, which of the following is the most appropriate advantage of using “stored procedures” that are available to all clients and do not need to be replicated in each client?

- a) Data traffic between client and server can be reduced.
- b) Distributed processing can be easily implemented.
- c) Memory usage of both client and server can be reduced.
- d) The number of access to the database can be reduced.

Q30. Which of the following is a concept that is included in both E-R and Enhanced E-R diagrams?

- a) Cardinality b) Generalization c) Specilization d) Superclass

Q31. When the SELECT statement is executed to join two tables T1 and T2 as shown below, which of the following tables is created?

SELECT * FROM T1 INNER JOIN T2 ON T1.V < T2.X

T1

U	V
aa	1
bb	2
cc	3

T2

X	Y	Z
3	4	7
2	5	8
1	6	b

- a)

U	V	X	Y	Z
aa	1	3	4	7
- b)

U	V	X	Y	Z
aa	1	3	4	7
bb	2	3	4	7
- c)

U	V	X	Y	Z
aa	1	3	4	7
bb	2	2	5	8
cc	3	1	6	b
- d)

U	V	X	Y	Z
aa	1	3	4	7
aa	1	2	5	8
bb	2	3	4	7

Q32. Which of the following is the appropriate SQL command that can be used to undo any changes made to the database since the last commit?

- a) Close b) Drop c) Revoke d) Rollback

Q33. Which of the following is the primary purpose of locking a resource in database management systems?

- a) To improve overall performance
- b) To maintain data integrity
- c) To prevent risk of deadlocks
- d) To prevent unauthorized access

Q34. There is a database that manages user information (user database). From a viewpoint of security management, which of the following is the appropriate access privilege granted to an application program that searches the user database and displays the results? Here, the functions of privileges are described below.

[Functions of privileges]

- Read privilege: Records on the user database can be read.
- Update privilege: Records on the user database can be registered, updated, and deleted.
- Administrator privilege: Tables on the user database can be read, registered, updated, and deleted.

- | | |
|----------------------------|-------------------------------|
| a) Administrator privilege | b) Read and update privileges |
| c) Read privilege | d) Update privilege |

Q35. Which of the following is an appropriate set of characteristics of a data warehouse in comparison with traditional databases?

- a) Integrated, non-subject-oriented, volatile, and time-variant
- b) Integrated, subject-oriented, non-volatile, and time-variant
- c) Integrated, subject-oriented, volatile, and time-invariant
- d) Non-integrated, subject-oriented, volatile, and time-variant

Q30. Which of the following is the data model that is organized as a tree-like structure using a parent-child or one-to-many relationship?

- a) Hierarchical data model
- b) Network data model
- c) Object data model
- d) Relational data model

Q31. Which of the following is the appropriate description concerning the third normal form (3NF) in a relational database?

- a) A set of relations or tables is in 3NF if all the key attributes are defined and it contains no repeating groups.
- b) A set of relations or tables is in 3NF if and only if it contains no repeating groups and every non-key attribute is fully functionally dependent on the entire primary key.
- c) A set of relations or tables is in 3NF if and only if it is in 2NF and every non-key attribute is mutually independent and directly dependent on the entire primary key.
- d) A set of relations or tables is in 3NF if and only if it is in Boyce-Codd normal form and contains no more than one multi-valued dependency.

Q32. Which of the following is the main purpose of using indexes in relational database tables?

- a) To enhance data security
- b) To ensure data integrity
- c) To improve query performance
- d) To prevent risk of deadlocks

Q33. Which of the following is the appropriate table that can be retrieved by performing the projection operation in order to choose the column “Product name” from the Cartesian (or direct) product of two tables T_1 and T_2 ?

T_1

Order number	Customer name	Product number
001	Brian Williams	A-01
002	Jake Forester	A-02
003	Sylvia Fox	A-02

T_2

Product number	Product name
A-01	Radio
A-02	TV set
A-03	CD player

a)

Product name
Radio
TV set

b)

Product name
Radio
TV set
CD player

c)

Product name
Radio
TV set
TV set

d)

Product name
Radio
TV set
TV set
CD player

Q34. When a transaction to the relational database is successfully completed, which of the following SQL commands can be used for making changes permanent?

- a) Checkpoint b) Commit c) Rollback d) Savepoint

Q35. Which of the following is the most appropriate description concerning the primary role of an SQL query optimizer?

- a) It determines the most efficient way to execute a query.
- b) It minimizes the number of rows in a result set.
- c) It parses a query and improves it for efficient network transmission.
- d) It stores the results of frequently used queries in a cache.

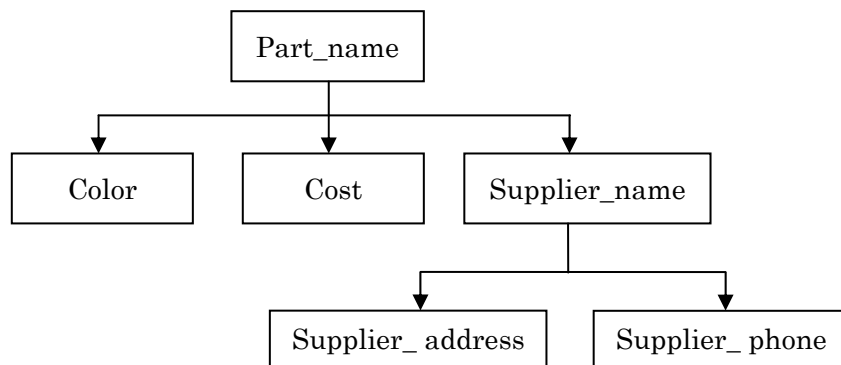
Q25. There are some methods of getting backup files for the purpose of recovering files and managing generations. Which of the following is an appropriate description concerning those methods or procedures?

- a) A differential backup contains all files changed after the last full backup, while an incremental backup saves all files changed after the last full, differential, or incremental backup.
- b) A differential backup may take longer to restore files than an incremental backup, because the most recent versions of files are spread across a larger number of backup sets.
- c) A multiplexed backup is used as a mixed combination of a full backup, a differential backup, and an incremental backup.
- d) An incremental backup tends to take longer to get backup files than a differential backup, because more files are copied during each backup.

Q30. Which of the following is the data model that was originally introduced for the purpose of conceptual modeling and is often used for logical modeling and physical modeling as well as conceptual modeling?

- a) E-R model
- b) Hierarchical model
- c) Network model
- d) Relational model

Q31. The figure below shows the relationships among data items used in a certain parts management system. When the system is implemented as a relational database, which of the following is the most appropriate and effective table structure of the relational database?



a) Parts table

Part_name	Color	Cost	Supplier_name	Supplier_address	Supplier_phone
-----------	-------	------	---------------	------------------	----------------

b) Parts table

Part_name	Color	Cost
-----------	-------	------

Supplier table

Supplier_name	Supplier_address	Supplier_phone
---------------	------------------	----------------

c) Parts table

Part_name	Color	Cost	Supplier_name
-----------	-------	------	---------------

Supplier table

Supplier_name	Supplier_address	Supplier_phone
---------------	------------------	----------------

d) Parts table

Part_name	Color	Cost
-----------	-------	------

Supplier table

Part_name	Supplier_name	Supplier_address	Supplier_phone
-----------	---------------	------------------	----------------

Q32. As shown below, there are two relational database tables Movie and Actor. Which of the following SQL statements should be used for retrieving a list of movie titles, released years, and directors, from all the movies that include “Action” or “Comedy” as a genre and “Cooper” as an actor’s name? Here, there is no movie remade with different actors, so “Title” and “Movie_title” are both primary keys in each table.

Movie (Released_year, Title, Director, Genre, Description)

Actor (Name, Movie_title, Role)

- a) `SELECT Movie_title, Released_year, Director FROM Movie, Actor
WHERE Name = 'Cooper '
AND (Genre = 'Action ' OR Genre = 'Comedy ')
AND Title = Movie_title`
- b) `SELECT Movie_title, Released_year, Director FROM Movie, Actor
WHERE Name = 'Cooper '
AND Genre = 'Action ' AND Genre = 'Comedy '
AND Title = Movie_title`
- c) `SELECT Title, Released_year, Director FROM Movie, Actor
WHERE Name = 'Cooper '
AND (Genre = 'Action ' OR Genre = 'Comedy ')`
- d) `SELECT Title, Released_year, Director FROM Movie, Actor
WHERE Name = 'Cooper '
AND Genre = 'Action ' AND Genre = 'Comedy '`

Q33. As shown below, there are four relational database tables Product, Supplier, Sale, and Employee that are used for a database system in a retail store. Here, the solid and dotted lines indicate the primary and foreign keys, respectively.

Product (ProdNo, ProdName, Cost, Price, SupplierNo)

Supplier (SupplierNo, SuppName, SuppAddress)

Sale (ProdNo, EmpNo, DateTime, Quantity)

Employee (EmpNo, EmpName, EmpAddress)

The number of records for each table is as follows:

Table name	Number of records	Remarks
Product	200	Each of the groups of 10 records has the same supplier.
Supplier	30	
Sale	10,000	Each of the groups of 100 records is from the same product.
Employee	10	

How many records are returned after execution of the SQL statement below?

```
SELECT * FROM Product A, Supplier B, Sale C
WHERE A.ProdNo = C.ProdNo AND A.SupplierNo = B.SupplierNo
```

- a) 200 b) 10,000 c) 10,230 d) 60,000,000

Q34. As shown in the table below, there are five transactions T_1 through T_5 that are performed simultaneously in parallel, in any order. Which of the following is the combination of transactions that has the possibility of a deadlock? Here, only one transaction can have an exclusive lock at a time. Shared locks can be used with multiple transactions.

T_1	T_2	T_3	T_4	T_5
X(A)	X(A)	X(B)	S(B)	X(C)
R(A)	R(A)	R(B)	S(A)	X(A)
W(A)	W(A)	W(B)	R(A)	R(A)
Commit	X(B)	S(C)	R(B)	R(C)
	R(B)	R(C)	Commit	W(C)
	W(B)	W(C)		W(A)
	Commit	Commit		Commit

The notation used in the above table is shown below.

Symbol	Operation
X(#)	Exclusive lock
S(#)	Shared lock
R(#)	Read
W(#)	Write
Commit	End transaction
#	Resource name

- a) T_1 , T_2 , and T_4
- c) T_2 , T_3 , and T_4

- b) T_1 , T_2 , and T_5
- d) T_2 , T_3 , and T_5

Q35. Which of the following explains the database rollback process?

- a) The “redo journal” is used to restore the data to the status immediately before the failure after the start of the transaction.
- b) The “redo journal” is used to restore the data to the status immediately before the start of the transaction.
- c) The “undo journal” is used to restore the data to the status immediately before the failure after the start of the transaction.
- d) The “undo journal” is used to restore the data to the status immediately before the start of the transaction.

Q34. Which of the following SQL statements corresponds to the “projection” operation of the relational algebra that can extract only the column “Continent” from the table “Country” and eliminate duplicates from the records returned?

Country

Name	Continent
Canada	North America
Malaysia	Asia
Malawi	Africa
Brazil	South America
Germany	Europe
China	Asia

- a) `SELECT * FROM Country`
- b) `SELECT * FROM Country GROUP BY Continent`
- c) `SELECT Continent FROM Country`
- d) `SELECT DISTINCT Continent FROM Country`

Q35. Among the ACID (Atomicity, Consistency, Isolation, Durability) properties of transactions, which of the following is the appropriate description concerning “atomicity”?

- a) A transaction is a basic unit of processing; it must be performed in its entirety, or else it must be cancelled.
- b) Every transaction must preserve the integrity constraints of the database. There is no contradiction at all in the database.
- c) Multiple simultaneous transactions cannot interfere with one another. Intermediate results within a transaction are not visible to other transactions.
- d) Once a transaction changes the database and the changes are committed, these changes must never be lost because of subsequent failures.

Q36. When a database on a client/server system is accessed, which of the following is the function that can reduce the network load by preparing the instruction groups beforehand that are frequently used on the server?

- a) Group commitment function
- b) Multithread function of a server process
- c) Stored procedure function
- d) Two-phase commitment function

Q37. Which of the following is the appropriate description concerning exclusive control in a database?

- a) When a shared lock is applied to a resource by a transaction, an exclusive lock can be applied to it by another transaction.
- b) When a shared lock is applied to a resource by a transaction, another shared lock can be applied to it by another transaction.
- c) When an exclusive lock is applied to a resource by a transaction, a shared lock can be applied to it by another transaction.
- d) When an exclusive lock is applied to a resource by a transaction, another exclusive lock can be applied to it by another transaction.

Q38. Which of the following appropriately describes a characteristic of distributed database systems in comparison to centralized database systems?

- a) A failure at a single site makes the whole system unavailable to all users.
- b) Acquisition and maintenance costs of the entire system are lower because of distributed nature.
- c) Expansion of the system, such as adding more data, increasing database sizes, and adding more processors, is much more difficult.
- d) Local queries and transactions accessing data at a single site have better performance because of the smaller local databases.

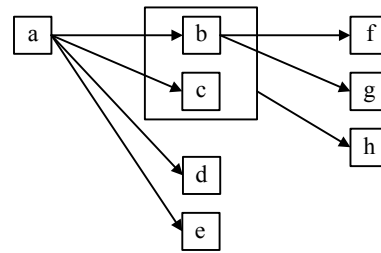
Q65. Which of the following is the purpose of periodically reorganizing a database in operation?

- a) Additions, updates, and deletions performed repeatedly on a database generate storage areas that cannot be reused, and therefore the database volume increases and the processing speed decreases. For this reason, such areas are reorganized to prevent performance degradation.
- b) It may become necessary to change a part of the database definitions, such as addition of data items, in the process of the database operations. In such a case, the database is reorganized so that it can be changed and reused.
- c) New records are created each time the records in the database are updated; thus, the database volume increases and the processing speed decreases. For this reason, multiple updated records are combined into one record to improve the processing speed.
- d) Once a record is deleted after it is registered as a key, it cannot be registered again. Since it is inconvenient, the keys are reorganized so that the deleted keys can be used again.

Q60. Which of the following is an appropriate explanation of the schema in a relational database management system?

- a) It is a set of data definitions, such as the data attributes, data formats, and relationships with other data.
- b) It is not an actual table, but instead a virtual table from the viewpoint of the user.
- c) It is the umbrella term for database operations, such as the insert, update, delete, and search operations for data.
- d) It is the umbrella term for various constraints that maintain database consistency.

Q61. $\boxed{x} \rightarrow \boxed{y}$ indicates that the value of attribute y is determined uniquely by the value of attribute x . Which of the following appropriately defines the relationships shown in the figure as a set of tables of the third normal form? Here, multiple attributes contained in a box \boxed{x} show that the value of attribute y is determined uniquely by the values of all those multiple attributes.



- | | |
|---|--|
| <p>a) Table 1 { a }</p> <p>Table 2 { b, c, d, e }</p> <p>Table 3 { f, g, h }</p> | <p>b) Table 1 { a, b, c, d, e }</p> <p>Table 2 { a, c }</p> <p>Table 3 { b, e, f, g, h }</p> |
| <p>b) Table 1 { a, b, c, d, e }</p> <p>Table 2 { b, c, f, g, h }</p> <p>Table 3 { b, c, h }</p> | <p>d) Table 1 { a, b, c, d, e }</p> <p>Table 2 { b, f, g }</p> <p>Table 3 { b, c, h }</p> |

Q62. Which of the following is a non-updatable view?

- a) A view for a view
- b) A view including a “GROUP BY” clause in the view definition
- c) A view including a “WHERE” clause in the view definition
- d) A view not including the primary key of the original table

Q63. There are two tables X and Y as shown below. Which of the following SELECT statements returns the maximum number of rows by using these two tables?

X	Y
VAL	VAL
1	1
2	2
3	3

- a) `SELECT * FROM X, Y`
- b) `SELECT * FROM X, Y WHERE X.VAL > Y.VAL`
- c) `SELECT * FROM X`
`UNION`
`SELECT * FROM Y`
- d) `SELECT * FROM X X1, X X2 WHERE X1.VAL = X2.VAL`

Q64. When a new record is inserted in the relational database table “Payment” shown below, which of the following SQL statements causes a unique constraint violation? Here, “Contract_number” and “Contract_date” are primary keys.

Payment

<u>Contract number</u>	<u>Contract date</u>	Amount
1001	2009-01-10	1,000
1003	2009-01-15	890
1003	2009-02-10	80

- a) INSERT INTO Payment VALUES (1001, '2009-01-15', 80)
- b) INSERT INTO Payment VALUES (1002, '2009-01-10', 970)
- c) INSERT INTO Payment VALUES (1003, '2009-01-10', 890)
- d) INSERT INTO Payment VALUES (1003, '2009-01-15', 1000)

Q65. Which of the following files is used for writing the values before and after a database update, and storing them as a database update record?

- a) Backup file
- b) Checkpoint file
- c) Dump file
- d) Journal file

Q60. As shown below, there are three tables Student, Instructor, and Result. Which of the following relational algebra operations can be used for deriving the table “Result” from the tables “Student” and “Instructor”?

Student		Instructor		Result	
First Name	Last Name	First Name	Last Name	First Name	Last Name
Jack	Smith	Susan	White	Susan	White
Tom	Brown	Paul	Miller	Paul	Miller
Nancy	Anderson	Jack	Smith	Betty	Wilson
David	Moore	Betty	Wilson		
Robert	Taylor	Tom	Brown		
Jennifer	Jones				
Barbara	Jackson				

- a) $\text{Instructor} \div \text{Student}$
- b) $\text{Instructor} \cap \text{Student}$
- c) $\text{Instructor} - \text{Student}$
- d) $\text{Instructor} \cup \text{Student}$

Q61. There are three tables T1, T2, and T3 as shown below. Which of the following tables is created as the result of executing the SQL statement specified below?

```
SELECT T3.D, SUM(T1.B)
FROM T1 NATURAL JOIN T2 NATURAL JOIN T3
GROUP BY T3.D
```

Table T1

A	B	C
1	10	1
2	20	1
3	30	2
4	40	4

Table T2

C	D
1	1
2	2
4	1
5	2

Table T3

D	E	F
1	9	1
2	8	2
5	7	3
6	6	4

a)

D	SUM(B)
1	70
2	30

b)

D	SUM(B)
1	30
2	30
4	40

c)

D	SUM(B)
1	10
2	20
5	0
6	0

d)

D	SUM(B)
1	10
1	20
2	30
4	40

Q62. When a program accesses relational database tables by means of embedded SQL statements, which of the following SQL statements is used to define the derived table?

- a) CLOSE
- b) DECLARE CURSOR
- c) FETCH
- d) OPEN

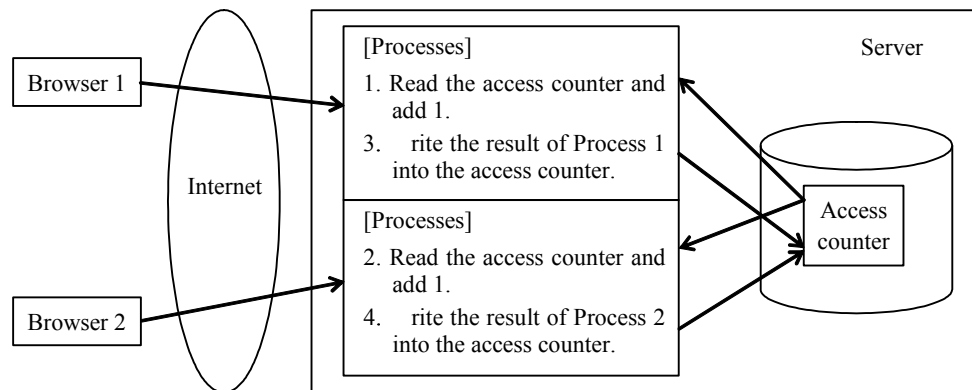
Q63. Which of the following is an appropriate description concerning the recovery process of databases?

- a) At the restart known as “cold start,” the checkpoint log and update information log are used for recovering the database.
- b) At the restart known as “warm start,” control goes back to the checkpoint, and the update information log is used for recovering the database.
- c) “Roll back” refers to the operation of reflecting the transactions that completed normally after the checkpoint, by checking the update information log.
- d) “Roll forward” refers to the operation of returning incomplete transactions at the occurrence of a failure to the status before update.

Q64. Which of the following is an appropriate description concerning the duties of database administrators?

- a) To allocate available development staff and resources in an optimal way for the system development using databases, and then manage them so that the system can be developed in an efficient way
- b) To conduct user interviews and create applications based on the external schema of the provided database
- c) To design and maintain databases, monitor their operations, and recover from failures
- d) To perform acceptance inspections to determine whether or not applications satisfy the functions, performance, operability, and other specifications required by users

Q65. For the purpose of finding out the number of times a Web page is accessed, an access counter is being designed. As shown in the figure, when two browsers gain access to the Web page simultaneously, Processes 1 through 4 are executed in this order on the server. When the access counter value is 100 before the two browsers access the Web page, what is the counter value at the completion of Process 4?



a) 100

b) 101

c) 102

d) 104

Q36. Which of the following is the term that refers to collecting a large volume of data through a variety of corporate activities, organizing, integrating, and saving the data for specific purposes, and using it for decision-making support, for example?

- a) Data administration
- b) Data dictionary
- c) Data mapping
- d) Data warehouse

Q60. Which of the following data models represents data relationships in a tree structure?

- a) E-R model
- b) Hierarchical model
- c) Relational model
- d) Network model

Q61. Which of the following is an appropriate explanation of a relational database?

- a) A parent record and child records are connected by means of pointers.
- b) Data and methods are encapsulated.
- c) Data is represented by two-dimensional tables.
- d) Tags are used to define data structures and meanings.

Q62. Which of the following is an appropriate explanation of “projection” in relational operations?

- a) Only specified attributes are extracted from tables, and a new table is created.
- b) The tuples in two tables that meet the relevant conditions are combined, and a new table is created.
- c) Tuples that commonly exist in two tables are extracted, and a new table is created.
- d) Tuples that meet given conditions are selected from tables, and a new table is created.

Q63. There are two tables “movie” and “movietype” as shown below. Which of the following tables is created as the result of executing the SQL statement specified below?

```
SELECT mName, mTypeCode, mCompany
FROM movie M, movietype MT
WHERE M.mTypeID = MT.mTypeID AND MT.mTypeName = 'Action'
```

movie

mID	mName	mTypeID	mDirector	mCompany
M01	Beowulf	01	Robert Zemeckis	Paramount Pictures
M02	Enchanted	02	Kevin Lima	Walt Disney Pictures
M03	This Christmas	03	Preston A. Whitmore II	Sony Pictures
M04	Hitman	01	Xavier Gens	20th Century Fox

movietype

mTypeID	mTypeCode	mTypeName
01	AC	Action
02	AD	Adventure
03	CO	Comedy

a)

mName	mTypeID	mCompany
Beowulf	01	Robert Zemeckis
Hitman	01	Xavier Gens

b)

mName	mTypeCode	mCompany
Beowulf	AC	Paramount Pictures
Hitman	AC	20th Century Fox

c)

mName	mTypeName	mCompany
Beowulf	Action	Paramount Pictures
Hitman	Action	20th Century Fox

d)

mName	mTypeCode	mCompany
Beowulf	AC	Paramount Pictures
Enchanted	AD	Walt Disney Pictures
This Christmas	CO	Sony Pictures
Hitman	AC	20th Century Fox

Q64. Which of the following appropriately describes a group function of SQL?

- a) A group function returns a group of results from one row.
- b) A group function returns a single result row per group for a set of queried rows.
- c) A group function returns multiple result rows per group for a set of queried rows.
- d) A group function returns one result from each row in the table.

Q65. Which of the following appropriately explains the SQL statements shown below?

```
CREATE TABLE STAFF (  
    Name          CHAR(256) ,  
    Birthdate     DATE,  
    DeptID        NUMBER  
)  
  
CREATE TABLE MANAGER UNDER STAFF AS (  
    ManagedDept   NUMBER  
)
```

- a) “SELECT * FROM STAFF” extracts all records in the table MANAGER.
- b) STAFF is called subtable, and MANAGER is called supertable.
- c) The table MANAGER has only one attribute.
- d) The table STAFF is composed of four attributes.

Q47. Full backup and differential backup are two methods of backing up a database. Which of the following appropriately describes the differential backup method?

- a) It requires a longer backup time than full backup.
- b) Only the differential data must be restored at error recovery time, so the recovery time is shorter than that of the full backup method.
- c) This method cannot be used in alternation with full backup.
- d) To recover a database, the full backup data is restored and then the differential backup data is added.

Q60. Which of the following is described graphically using an E-R diagram?

- a) Data flows between processes
- b) Data source and destination
- c) Entities and relationships between entities
- d) Hierarchical data structure

Q61. You are building a new database for a company with 10 departments. Each department contains multiple employees. In addition, each employee might work for several departments. How should you logically model the relationship between the department entity and the employee entity?

- a) Create a mandatory one-to-many relationship between department and employee.
- b) Create a new entry, create a one-to-many relationship from the employee to the new entry, and create a one-to-many relationship from the department entry to the new entry.
- c) Create a new entry, create a one-to-many relationship from the new entry to the employee entry, and then create a one-to-many relationship from the entry to the department entry.
- d) Create an optional one-to-many relationship between department and employee.

Q62. Which of the following is an appropriate explanation concerning functions of keywords in SQL?

- a) “HAVING” specifies a search condition for an aggregate or a group.
- b) “INDEX” is a special way to join two or more tables.
- c) “LIKE” is used along with JOIN clause.
- d) “VALUES” is used to sort the data in ascending or descending order.

Q63. User *A* issues the command as follows:

```
UPDATE cust_orders
SET id = 200
WHERE id = 1
```

Then user *B* issues this command as follows:

```
UPDATE cust_orders
SET id = 300
WHERE id = 1
```

User *B* informs you that his/her UPDATE statement seems to be hung. Which of the following is a possible solution that you can find?

- a) Ask user *A* to commit the transaction.
- b) Ask user *B* to abort the statement.
- c) Ask user *B* to commit the transaction.
- d) No action is required.

Q64. There is a table including the data items shown below. Which of the following SQL statements can insert a new row in the “student” table?

Name	Null?	Type
STUD_ID	NOT NULL	NUMBER(3)
NAME	NOT NULL	VARCHAR2(25)
ADDRESS		VARCHAR2(50)
GRADUATION		DATE

- a) `INSERT INTO student (stud_id, address, graduation)
VALUES (101, 'Dave', '100 Happy Lane', '2001-06-14');`
- b) `INSERT INTO student (stud_id, address, name, graduation)
VALUES (101, '100 Happy Lane', 'Dave', '2001-06-14');`
- c) `INSERT INTO student
VALUES (101, '100 Happy Lane', '2001-06-14', 'Dave');`
- d) `INSERT INTO student
VALUES (101, 'Dave', '100 Happy Lane', '2001-06-14');`

- Q65.** There is a student score table shown below with basic and advanced subject codes which begin with letters B and A respectively. Which of the following SQL statements can be used to retrieve students, from the score table, whose basic subject score is 70 or more and examination date is 2007-05-04?

score_table

student_number	subject_code	score	examination_date
1221	A01	70	2007-05-03
1201	A01	60	2007-05-03
1231	A02	90	2007-05-03
1201	B01	85	2007-05-04
1231	B01	80	2007-05-04
1231	B02	75	2007-05-03
1221	B02	60	2007-05-04

- a) `SELECT * FROM score_table
WHERE score >=70 AND examination_date = '2007-05-04'`
- b) `SELECT student_number FROM score_table
WHERE score >=70 AND examination_date = '2007-05-04'`
- c) `SELECT student_number FROM score_table
WHERE score >=70 AND examination_date = '2007-05-04' AND
subject_code LIKE 'B%'`
- d) `SELECT * FROM score_table
WHERE score >=70 AND examination_date = '2007-05-04' AND
subject_code LIKE 'B_ _'`

Q66. In database recovery management, which of the following appropriately explains incremental logging with deferred update?

- a) Both the old and new values of the updated item are stored in the log.
- b) Neither the old nor new value is stored in the log.
- c) The new value of the updated item is stored in the log.
- d) The old value of the updated item is stored in the log.

Q66. Which of the following is the correct table that is created by the “natural join” operation of two tables T_1 and T_2 ?

T_1			T_2		
A	B	C	B	C	D
a_1	b_1	c_1	b_1	c_1	d_1
a_2	b_1	c_1	b_1	c_2	d_2
a_3	b_2	c_1	b_2	c_2	d_3

a)

A	B	C	D
a_1	b_1	c_1	d_1

b)

A	B	C	D
a_1	b_1	c_1	d_1
a_2	b_1	c_1	d_1

c)

A	B	C	B	C	D
a_1	b_1	c_1	b_1	c_1	d_1
a_2	b_1	c_1	b_1	c_1	d_1

d)

A	B	C	D
a_1	b_1	c_1	d_1
a_2	b_1	c_1	d_2
a_3	b_2	c_1	d_3

Q67. Which of the following is the appropriate description of a lock that is the exclusive control of a database?

- a) If a lock is used, deadlock cannot occur.
- b) Locks come in two types: shared locks, used while reading, and exclusive locks, used during a change.
- c) The coarser the level of granularity of locked data is, the more concurrent transactions can be executed.
- d) When deadlock occurs, the lock rolls back the transaction on both sides.

Q68. In a database system employing incremental log with immediate updates, information in the log is used in restoring the state of the system to a previous consistent state when a crash occurs. A log record is generated upon execution of a write operation. Each log record consists of the transaction name T_i , the data item name, the old value of the data item, and the new value of the data item. The log record shown below is the normal transaction sequence after the last checkpoint. Which of the following recovery actions should be performed after a restart of the system if a crash occurs just after $\langle T_2, C, 3000, 3500 \rangle$ and before $\langle T_2, \text{commit} \rangle$?

[Log records]

$\langle T_1, \text{start} \rangle$

$\langle T_1, A, 1000, 900 \rangle$

$\langle T_1, B, 2000, 2100 \rangle$

$\langle T_1, \text{commit} \rangle$

$\langle T_2, \text{start} \rangle$

$\langle T_2, C, 3000, 3500 \rangle$

$\langle T_2, \text{commit} \rangle$

- | | |
|--------------------------------------|---|
| a) Roll back both T_1 and T_2 | b) Roll back T_1 and roll forward T_2 |
| c) Roll forward both T_1 and T_2 | d) Roll forward T_1 and roll back T_2 |

Q69. Which of the following is the appropriate SQL statement that is used to create Table A from Persons Table?

Persons Table

name	age	gender	country
Honey	23	F	Korea
Jun	24	M	Japan
Mark	22	M	Korea
Rey	27	M	Philippines
Rob	26	M	Philippines
Sakura	27	F	Japan

Table A

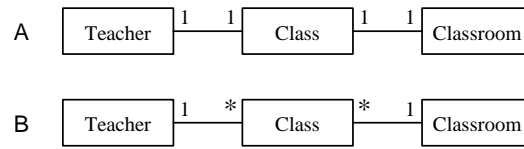
name
Honey
Rob

- a) `SELECT name FROM Persons WHERE country LIKE '%Korea%' AND gender = 'F' AND age = 26`
- b) `SELECT name FROM Persons WHERE country LIKE '%Korea%' AND gender = 'F' OR age = 26`
- c) `SELECT name FROM Persons WHERE country LIKE '%Korea%' OR gender = 'F' AND age = 26`
- d) `SELECT name FROM Persons WHERE country LIKE '%Korea%' OR gender = 'F' OR age = 26`

Q38. Which of the following functions can reduce the network load by placing a frequently-used instruction set on the server in advance, when accessing a database in a client/server system?

- a) Group commitment function
- b) Multi-thread function of server process
- c) Stored procedure function
- d) Two-phase commitment function

Q51. The entity-relationship diagrams **A** and **B** shows the relationships between three entities in a school: teacher, class, and classroom. Which of the following is an appropriate interpretation concerning the diagrams? Here, " 1 1 " shows a one-to-one relationship while " 1 * " shows a one-to-many relationship.



- a) In **A**, a teacher is responsible for one class only. In **B**, a teacher may be responsible for one or more classes.
- b) In **A**, one class is always assigned to the same classroom. In **B**, one class may be assigned to one or more classrooms.
- c) In **A**, one class is always supervised by one teacher. In **B**, one class may be supervised by one or more teachers.
- d) In **A**, when a teacher or a classroom is decided, a single class will be decided. In **B**, if a teacher and a classroom are decided, a single class will be decided.

Q66. Which of the following appropriately describes a schema in a relational database management system?

- a) It is a set of data definitions such as the data properties, format, relationship with other data, etc.
- b) It is not an actual table but a virtual table from the perspective of the user.
- c) It is the general term for database operations such as data insertion, updating, deletion, search, etc.
- d) It is the general term for various conditions and constraints that are used to maintain the database in absolutely perfect condition.

Q67. Which of the following appropriately describes a domain (defined area), a term used for relational databases?

- a) It is a relationship derived by applying the relational operations to the basic relationship.
- b) It is a set of values that attributes can hold.
- c) It is a specification for copying the real world to a database.
- d) It is the general term for data insertion, updating, deletion, and search in a database.

Q68. Which of the following operations extracts specific columns from tables in a relational database?

- a) Join b) Projection c) Selection d) Union

Q69. When a transaction fails, which of the following should be performed in order to abort it and to rebuild the previous state of the database?

- a) Archive
- b) Checkpoint dump
- c) Commit
- d) Rollback

Q26. The employee's ID, name, salary, manager ID, and working department are recorded in the *Employees* table as follows:

Employees

Emp_ID	Emp_name	Salary	Manager_ID	DID
10	Amit	50000	18	3
11	Vikrom	75000	16	2
12	Nishi	40000	18	3
13	Niloy	60000	17	1
14	Pritom	80000	18	3
15	Mohitlal	45000	18	3
16	Rahman	90000	null	1
17	Roxy	55000	16	2
18	Santosh	65000	17	1

When a query is formulated in SQL to retrieve the manager ID and the average salary of the employees under his/her direct report, and the output is obtained as below, which of the following is the appropriate combination to be inserted in blanks E and F in the SQL statement?

```
select [ E ] as "Manager_ID",
       avg(a.Salary) as "Average_Salary"
from Employees a, Employees b
where [ E ] = [ F ]
group by [ E ]
order by [ E ]
```

Manager_ID	Average Salary
16	65000
17	62500
18	53750

	E	F
a)	a.DID	b.DID
b)	a.Emp_ID	b.Emp_ID
c)	a.Manager_ID	b.Manager_ID
d)	b.Emp_ID	a.Manager_ID

Q4. For two sets A and B of cardinalities 3 and 2, how many maps from A to B exist?

a) 1

b) 5

c) 8

d) 9