Brookshear-*Computer Science: An Overview*, 9th edition

Test Bank—Chapter Nine (Database Systems)

Multiple Choice Questions

1. Which of the following accesses a database in terms of a database model?

A. Application software B. Database management system C. Actual database

ANSWER: A

2. Which of the following describes only the portion of a database available to a particular user?

A. Database model B. Schema C. Subschema D. DBMS

ANSWER: C

3. Which of the following relational operations combine data from more than one relation?

A. SELECT B. PROJECT C. JOIN

ANSWER: C

4. Which of the following relational operations extracts entire columns from a relation?

A. SELECT B. PROJECT C. JOIN

ANSWER: B

5. Which of the following relational operations extracts entire rows from a relation?

A. SELECT B. PROJECT C. JOIN

ANSWER: A

6. Which of the following relational operations is performed by the SQL statement below?

```
select A, B, C
  from X
```

A. SELECT B. PROJECT C. JOIN

ANSWER: B

7. Given the relation X below

X:

A	B	C
2	5	7
3	3	3
4	3	2
5	2	8

what value will be extracted by the following query?

```
TEMP ← SELECT from X where B > C
RESULT ← PROJECT A from TEMP
```

A. 2 B. 3 C. 4 D. 5

ANSWER: C

8. Given the relation X below

X:

A	B	C
2	5	7
3	3	3
4	4	2
5	2	8

what value will be retrieved by the following query?

```
TEMP ← SELECT from X where B = C
RESULT ← PROJECT B from TEMP
```

A. 2 B. 3 C. 4 D. 5

ANSWER: B

9. Given the relation below

X:

A	B	C
2	5	7
3	3	6
4	4	2
5	2	2

what values will be retrieved by the following SQL statement?

```
select A, B
  from X
  where X.B = X.C
```

A. 2, 5 B. 3, 6 C. 2, 2 D. 5, 2

ANSWER: D

10. Given the two relations X and Y below

X:

A	B
7	s
2	z

Y:

C	D
t	3
r	2

what value would be retrieved by executing the following SQL statement?

```
select Y.C
  from X, Y
  where X.A < Y.D
```

A. s B. z C. t D. r

ANSWER: C

11. Which of the following is not a potential problem caused by multiple transactions manipulating a database at the same time?

A. Lost update problem B. Clustering C. Deadlock D. Incorrect summary problem

ANSWER: B

12. Which of the following features within a DBMS is not provided to maintain database integrity?

A. Concurrent transaction processing B. Log
C. Locking protocol D. Commit points

ANSWER: A

13. Which of the following data mining techniques would be applied when trying to identify traits that characterize the citizens of a democracy who fail to vote?

A. Class description B. Class discrimination
C. Cluster analysis D. Association analysis

ANSWER: A

14. Which of the following data mining techniques would be applied when trying to identify traits that predict whether a citizen in a democracy will or will not vote?

A. Class description B. Class discrimination
C. Cluster analysis D. Association analysis

ANSWER: B

15. Which of the following data mining techniques would be applied when trying to identify any underlying heterogeneity within housing patterns in a community?

A. Class description B. Class discrimination
C. Cluster analysis D. Association analysis

ANSWER: C

16. Which of the following data mining techniques would be applied when trying to identify common properties between different groups of shoppers?

A. Class description B. Class discrimination
C. Cluster analysis D. Association analysis

ANSWER: D

17. Which of the following file structures is most efficient in cases in which the file is always processed in its entirety a predetermined order?

A. Sequential B. Indexed C. Hash

ANSWER: A

18. Which of the following file structures is commonly used for the storage of text files?

A. Sequential B. Indexed C. Hash

ANSWER: A

19. Which of the following file structures is associated with the problem of clustering?

A. Sequential B. Indexed C. Hash

ANSWER: C

20. Which of the following file structures requires a small "auxiliary" storage system that must be updated as entries in the file are inserted or deleted.

A. Sequential B. Indexed C. Hash

ANSWER: B

Fill-in-the-blank/Short-answer Questions

1. In a relational database, information is presented as though it were stored in tables called

_____ , each of which has columns called _____ and rows

called _____ .

ANSWER: Relations, attributes, tuples

2. Identify two database models.

_____

_____

ANSWER: Possible answers include: relational and object-oriented

3. The term "lossless decomposition" refers to a decomposition of one relation into several relations such

that _____ .

ANSWER: no information is lost

4. Suppose a relation X had the attributes `PartID` (part identification number), `StockGoal` (quantity held when fully stocked), and `CurrentQuantity` (quantity actually in stock). Complete the following statement to obtain information about those parts that are not fully stocked.

```
Result ← SELECT from X where _____
```

ANSWER: `StockGoal ≠ CurrentQuantity`

5. Suppose a relation X had the attributes `Name`, `EmployeeID`, and `Address`. Complete the following statement to obtain a list of the names and addresses of all employees.

```
Result ← _____________________________________ from X
```

ANSWER: `PROJECT Name, Address`

6. Given the two relations X and Y below

X:	A	B
	2	s
	5	z

Y:	C	D
	t	1
	r	3
	w	2

what values would be in the tuple produced by the following statement?

```
Result ← JOIN X and Y where X.A < Y.D
```

_____

ANSWER: 2, s, r, 3

7. Given the two relations X and Y below

X:	A	B
	2	s
	5	z

Y:	C	D
	t	1
	r	3
	w	2

what values would be in the tuple produced by the following statements?

```
Temp ← JOIN X and Y where X.A = Y.D
Result ← PROJECT X.B, Y.C from Temp
```

_____

ANSWER: s, w

8. Given the two relations X and Y below

X:	A	B
	7	s
	3	z
	1	u

Y:	C	D
	t	1
	r	2

what values would be retrieved by executing the following statement?

```
select X.A, X.B, Y.C
  from X, Y
  where X.A < Y.D
```

_____

ANSWER: 1, u, t

9. Given the three relations X, Y, and Z below

X:	A	B
	7	s
	3	z
	1	u

Y:	C	D
	t	4
	r	2

Z:	E	F
	2	w
	3	q

what values would be retrieved by executing the following statement?

```
select X.B, Y.C, Z.F
  from X, Y, Z
  where X.A > Y.D and X.A = Z.E
```

_____

ANSWER: z, r, q

10. Which of the operations SELECT, PROJECT, and JOIN are actually used when executing the following SQL instruction?

```
select A, B
  from X
  where C = D
```

_____

ANSWER: SELECT, PROJECT

11. Given the relation `Employees` containing the attributes `Name`, `Address`, and `BirthDate`, what question is answered by the following sequence of operations?

```
Temp ← SELECT from Employees where BirthDate < “January 4, 1975”
Result ← PROJECT Name from Temp
```

_____

ANSWER: Which employees were born before January 4, 1975?

12. Given the relation `Employees` containing the attributes `Name`, `Address`, and Current`JobID` and the relation `Jobs` containing the attributes `JobID`, `SkillRating`, `Department`, what question is answered by the following sequence of operations?

```
Temp1 ← JOIN Employees and Jobs
          where Employees.CurrentJobID = Jobs.JobID
Temp2 ← SELECT from Temp1 where Department = “Personnel”
Result ← PROJECT Name from Temp2
```

_____

ANSWER: Which employees work in the personnel department?

13. Given the relation `Employees` containing the attributes `Name`, `Address`, and Current`JobID` and the relation `Jobs` containing the attributes `JobID`, `SkillRating`, `Department`, what question is answered by the following SQL statement?

```
select SkillRating
  from Employees, Jobs
  where Employees.Name = "Joe Smith"
        and Employees.CurrentJobID = Jobs.JobID
```

_____

ANSWER: What is the skill rating of Joe Smith's job?

14. Place an X in the space before those requests below that require data mining techniques rather than traditional database techniques. Leave the other spaces blank.

_____ Identify all shoppers who bought dog food last week.

_____ Identify items that tend to be purchased by common shoppers.

_____ Identify any correlation between time-of-day and items purchased.

_____ Identify the items purchased during the first hour after opening the store.

ANSWER: Second and third

15. Place an X in the space before those issues that are not problems associated with data mining. Leave the other spaces blank.

_____ Cascading rollback

_____ Deadlock

_____ Incorrect summary problem

_____ Lost update problem

ANSWER: All of them

16. Place an X in the space before those questions whose answers might be obtained by means of sequential pattern analysis. Leave the other spaces blank.

_____ What are progressing stages in youthful behavior that led to criminal activity?

_____ What are the symptoms of the various stages of a particular progressing disease?

_____ What crimes does a particular judge punish most harshly?

_____ What items had the highest sales volume last week?

ANSWER: First and second

17. Place an X in the space before those questions whose answers might be obtained by means of outlier analysis. Leave the other spaces blank.

_____ Which are the flawed parts on a production line conveyor belt?

_____ What items have not sold during the last two days?

_____ What sales region generated the most orders over the last sales period?

_____ Which shoppers in a busy shopping mall are potential shoplifters?

ANSWER: First and last

18. Place an X in the space before those structures that are designed to provide efficient access to randomly chosen items. Leave the other spaces blank.

_____ Sequential file

_____ Indexed file

_____ Hash file

_____ Hash table

ANSWER: Second, third, and fourth

19. Suppose you were going to construct a hash file with 20 to 25 buckets using the division hash function discussed in the text. How many buckets should you actually use?

_____

ANSWER: 23

20. List four data mining techniques.

_____

_____

_____

_____

ANSWER: Possible answers include: class description, class discrimination, cluster analysis, association analysis, outlier analysis, and sequential pattern analysis.

Vocabulary (Matching) Questions

The following is a list of terms from the chapter along with descriptive phrases that can be used to produce questions (depending on the topics covered in your course) in which the students are ask to match phrases and terms. An example would be a question of the form, “In the blank next to each phrase, write the term from the following list that is best described by the phrase.”

Term	**Descriptive Phrase**
database model	A conceptual organization of data within databases

schema	A “road map” of a particular database’s design
DBMS	Performs database operations requested by application software
SQL	A popular language that implements relational database operations
relation	A structural unit (with rows and columns) in a popular database model
relational operations	Select, project, and join
roll back	To “unwind” a transaction
commit point	The time at which a DBMS guarantees that a transaction’s actions will be reflected in a database
locking protocol	A system to guard against database errors due to performing transactions concurrently
data mining	The process of extracted hidden information
data warehouse	The information system to which data mining techniques are applied
hash file	A storage structure that provides efficient access to randomly chosen items
clustering	A major problem when manipulating hash files
sequential file	A storage structure that associates a specific order with its contents
index	A means of locating a particular record within a file
key field	An item used to identify records uniquely

General Format Questions

1. What information is available from a relational database containing one relation with the attributes Name, Employee identification number, and Address that is not available from a database containing two relations, one with attributes Name and Address and the other with attributes Address and Employee identification number? Explain your answer.

ANSWER: The connection between an employee’s name and identification number may not be available in the second database because two employees may have the same address.

2. Given the two relations X and Y below

X:

A	B
2	s
5	z

Y:

C	D
t	1
r	3
w	2

draw the relation Result that would be produced by the following statements?

```
Temp ← JOIN X and Y where X.A > Y.D
Result ← PROJECT X.B, Y.C from Temp
```

ANSWER:

X.B	Y.C
s	t
z	t
z	r
z	w

3. Translate the following query into a single SQL statement.

```
Temp ← SELECT from X where A = B
Result ← PROJECT A, C from Temp
```

ANSWER: `select A, C from X where A = B`

4. Given a relation called `People` whose attributes are `Name`, `Father`, and `Mother` (containing each person's name as well as the name of that person's parents), write an SQL statement to obtain a list of all the children of Nathan.

ANSWER:
```
select Name
    from People
    where Father = "Nathan"
```

5. Given the relation `Parts` containing the attributes `PartName`, `PartNumber`, and `SupplierID` as well as the relation `Suppliers` containing the attributes `SupplierID`, `Address`, `FaxNumber`, write an SQL statement to obtain the supplier identifications and fax numbers for all the suppliers that supply the part whose part number is X4J26.

ANSWER:
```
select Suppliers.SupplierID, Suppliers.FaxNumber
    from Parts, Suppliers
    where Parts.PartNumber = "X4J26"
          and Parts.SupplierID = Suppliers.SupplierID
```

6. Given the relation `Parts` containing the attributes `PartName`, `PartNumber`, and `SupplierID` as well as the relation `Suppliers` containing the attributes `SupplierID`, `Address`, `FaxNumber`, write a sequence of SELECT, PROJECT, and JOIN operations to obtain the supplier identifications and fax numbers for all the suppliers that supply the part whose part number is X4J26.

ANSWER:
```
Temp1 ← SELECT from Parts
            where PartNumber = "X4J26"
Temp2 ←JOIN Temp1 and Suppliers
            where Temp1.SupplierID = Suppliers.SupplierID
Result ← PROJECT Suppliers.SupplierID, Suppliers.FaxNumber
            from Temp2
```

7. If a database contained a relation containing information about individual people (name, address, birthday, etc.) and another relation containing information about music composers (name, style, education level, etc.), how would you extend the database's design to include links between each individual and his or her favorite composer?

ANSWER: The main idea would be to add a new relation providing the links. It might contain the attributes IndividualName and ComposerName. The problem with this approach is that individual names may not be unique throughout the database so it may be necessary to add an identification number attribute to the "individuals" relation. This uniqueness issue also arises in the case of composer names.

8. Describe a scenario in which computing the total deposits in a bank while also transferring $100 from account X to account Y would result in a final sum that is $100 too great. Then describe a scenario in which the final sum turns out to be $100 too small.

ANSWER: The first occurs if the process of computing the total checks account X before the funds are withdrawn and account Y after the funds are deposited. The second occurs if account Y is checked before the funds are deposited and X is checked after the funds are withdrawn.

9. Describe the wound-wait protocol.

ANSWER: Young transactions must release data items they are using when the items are needed by older transactions. The young transactions are then rolled back.

10. Describe the distinction between a traditional database and a data warehouse.

ANSWER: A traditional database is dynamic in the sense that it is subject to change as updates are made. In contrast, a data warehouse is static in the sense that no updates are made. Moreover, a data warehouse may encompass more than one database.

11. Describe the distinction between class description and cluster analysis.

ANSWER: Class description attempts to find traits that characterize a known class, whereas cluster analysis attempts to find traits that identify previously unknown classes.

12. What does it mean to say that an object is persistent?

ANSWER: A persistent object is one that is saved for future reference as opposed to existing merely during the execution of a single program. (An object-oriented database consists of persistent objects.)