

## ***Database Systems (Jukic)***

### **Chapter 1 Introduction**

#### 1.1 Multiple Choice Questions

1) Which of the following is a format in which data can appear?

- A) Text
- B) Numbers
- C) Image
- D) All of the above

Answer: D

Diff: 1 Page Ref: 1

2) The *description of the structure and the properties of the data* fits into which category?

- A) Information
- B) Data
- C) Metadata
- D) DBMS

Answer: C

Diff: 1 Page Ref: 2

3) *Joe* is an example of:

- A) Data
- B) Metadata
- C) Data Type
- D) DBMS

Answer: A

Diff: 1 Page Ref: 1-2

4) *FirstName* is an example of:

- A) Data
- B) Metadata
- C) Data Type
- D) DBMS

Answer: B

Diff: 1 Page Ref: 1-2

5) Which of the following is typically found in the database metadata?

- A) Employee names
- B) Data types
- C) Student ages
- D) Product prices

Answer: B

Diff: 2 Page Ref: 2

6) DBMS is software used for the following purpose:

- A) Creation of databases
- B) Insertion, storage, retrieval, update, and deletion of the data in the database
- C) Maintenance of databases
- D) All of the above

Answer: D

Diff: 1 Page Ref: 2

7) Which of the following is a component of a database system?

- A) Database
- B) DBMS
- C) Front-end applications
- D) All of the above

Answer: D

Diff: 1 Page Ref: 3

8) Which of the following requires that the end user knows how to issue commands to the specific DBMS?

- A) Direct interaction
- B) Indirect interaction
- C) Both direct and indirect interaction
- D) Neither direct nor indirect interaction

Answer: A

Diff: 2 Page Ref: 4

9) Which of the following is a part of the database requirements step?

- A) Database deployment
- B) Logical modeling
- C) Conceptual modeling
- D) Database implementation

Answer: C

Diff: 2 Page Ref: 4

10) Requirements can be refined and/or expanded following:

- A) Database deployment
- B) Logical modeling
- C) Database use
- D) All of the above

Answer: D

Diff: 2 Page Ref: 5

11) Implicit changes of requirements are permitted during:

- A) Database deployment
- B) Logical modeling
- C) Database use
- D) Implicit changes of requirements are not permitted

Answer: D

Diff: 2 Page Ref: 6

12) Database implementation involves using \_\_\_\_\_ to implement the database model as an actual database.

- A) Front-end applications
- B) DBMS
- C) Database system
- D) Indirect interaction

Answer: B

Diff: 2 Page Ref: 6

13) Front-end applications facilitate:

- A) Direct use
- B) Indirect use
- C) Both direct and indirect use
- D) Neither direct nor indirect use

Answer: B

Diff: 2 Page Ref: 7

14) Which of the following is a database use action?

- A) Securing data
- B) Storing data
- C) Modifying data
- D) Modeling data

Answer: C

Diff: 2 Page Ref: 7

15) The difference in the scope of databases is reflected in the:

- A) Number of the development steps
- B) Cost in time and resources required for each of the development steps
- C) Level of importance of each of the development steps
- D) Order of the development steps

Answer: B

Diff: 2 Page Ref: 8

16) \_\_\_\_\_ are in charge of implementing the database model as a functioning database using the DBMS software.

- A) Database analysts
- B) Database architects
- C) Database developers
- D) DBAs

Answer: C

Diff: 2 Page Ref: 9

17) End users can vary in:

- A) Their level of technical sophistication
- B) The amount of data they need
- C) The frequency with which they access the database system
- D) All of the above.

Answer: D

Diff: 1 Page Ref: 9

18) Information can be used for:

- A) Operational purposes only
- B) Analytical purposes only
- C) Operational and analytical purposes
- D) Neither for operational nor for analytical purposes

Answer: C

Diff: 1 Page Ref: 9

19) Which of the following is an example of a daily operational procedure or task supported by an operational database?

- A) Deducting the correct amount of money from a customer's checking account upon an ATM withdrawal
- B) Issuing a correct bill to a customer who purchased an airline ticket
- C) Both A and B
- D) None of the above

Answer: C

Diff: 1 Page Ref: 10

20) Which of the following is an example of analytical information?

- A) Information about the amount of money in a checking account
- B) Information showing which airline routes in the United States have the most sales
- C) Information about the cost of a product
- D) Information showing the destination and origin of a particular airline route in the United States

Answer: B

Diff: 2 Page Ref: 10

## 1.2 True/False Questions

1) The term *data* refers to facts that are recorded and can be accessed.

Answer: TRUE

Diff: 1 Page Ref: 1

2) The term *information* refers to the data that is accessed by a user for some particular purpose.

Answer: TRUE

Diff: 1 Page Ref: 1

3) The terms *data* and *information* should never be used as synonyms for each other.

Answer: FALSE

Diff: 2 Page Ref: 1

4) Metadata is a subset of data that is most recently entered.

Answer: FALSE

Diff: 1 Page Ref: 2

5) A DBMS can be used for creation of databases.

Answer: TRUE

Diff: 1 Page Ref: 2

6) A DBMS can be used for insertion and retrieval of the data in the database.

Answer: TRUE

Diff: 1 Page Ref: 2

7) A DBMS is a presentation software (such as MS Power Point).

Answer: FALSE

Diff: 1 Page Ref: 2

8) Front-end applications are created in order to provide a mechanism for easy interaction between the database and the DBMS.

Answer: FALSE

Diff: 2 Page Ref: 3

9) The type of interaction between the end user and the database that involves front-end applications is called direct interaction.

Answer: FALSE

Diff: 2 Page Ref: 3

10) Indirect interaction requires that the end user knows how to issue commands to the specific DBMS.

Answer: FALSE

Diff: 2 Page Ref: 4

11) *Conceptual data modeling* is another term for requirements visualization.

Answer: TRUE

Diff: 1 Page Ref: 5-6

12) During a proper requirements collection process, the requirements can be added iteratively and implicitly.

Answer: FALSE

Diff: 3 Page Ref: 6

13) The logical database model is created prior to the conceptual database model.

Answer: FALSE

Diff: 1 Page Ref: 6

14) The new version of a database is created following the same development steps as the initial version.

Answer: TRUE

Diff: 1 Page Ref: 7



15) Databases of different scope are developed following different fundamental development steps.

Answer: FALSE

Diff: 2 Page Ref: 8

16) Database administration encompasses the tasks related to the maintenance and supervision of a database system.

Answer: TRUE

Diff: 1 Page Ref: 9

17) Information that is collected in database systems can be used, in general, for two purposes: an operational purpose and a transactional purpose.

Answer: FALSE

Diff: 2 Page Ref: 9

18) The term operational information refers to the information collected and used in support of day-to-day operational needs.

Answer: TRUE

Diff: 1 Page Ref: 10

19) Analytical databases collect and present operational information in support of daily operational procedures and processes.

Answer: FALSE

Diff: 1 Page Ref: 10

20) Analytical information is based on operational information.

Answer: TRUE

Diff: 1 Page Ref: 10

### 1.3 Essay Questions

1) Explain the relationship between the terms *data* and *information*.

Answer: The term data refers to facts that are recorded and can be accessed. The data is recorded and kept because it is considered to be of use to an intended user. The term information refers to the data that is accessed by a user for some particular purpose. Typically, getting the needed information from a collection of data requires performing an activity, such as searching through, processing, or manipulating the data in some form or fashion. The terms *data* and *information* are often interchanged and used as synonyms for each other. Such practice is very common and is not necessarily wrong, since information is simply the data that we need. If the data that an organization gathers and stores has a purpose and satisfies a user's need, then such data is also information.

Diff: 2 Page Ref: 1-2

2) What is metadata?

Answer: Metadata is the data that describes the structure and the properties of the data. Metadata is essential for the proper understanding and use of the data.

Diff: 1 Page Ref: 2

3) What is a database and what is its purpose?

Answer: A database is a structured collection of related data stored on a computer medium. The purpose of a database is to organize the data in a way that facilitates straightforward access to the information captured in the data.

Diff: 1 Page Ref: 2

4) What does the database metadata contain?

Answer: The database metadata contains the names of data structures (e.g., names of tables, names of columns), data types, data descriptions, and other information describing the characteristics of the data that is being stored in a database.

Diff: 1 Page Ref: 2

5) What is the purpose of a DBMS?

Answer: A database management system (DBMS) is software used for creation of databases, for insertion, storage, retrieval, update, and deletion of the data in the database, and for maintenance of databases.

Diff: 1 Page Ref: 2

6) Create an example that shows data without its metadata and then the same data with its metadata.

Answer: Figures 1.1 and 1.2 (or similar example).

Diff: 1 Page Ref: 2

7) Using an example, describe the relationship between a DBMS and a database.

Answer: For example, the relationship between a DBMS and a database is similar to the relationship between the presentation software (such as MS PowerPoint) and a presentation. Presentation software is used to create a presentation, insert content in a presentation, conduct a presentation, and change or delete content in a presentation.

Diff: 1 Page Ref: 2-3

8) What is a database system?

Answer: A database system is a computer-based system, and its purpose is to enable an efficient interaction between the users and the information captured in a database.

Diff: 1 Page Ref: 3

9) Illustrate a typical database system architecture.

Answer: Figure 1.3

Diff: 2 Page Ref: 3

10) Describe the two types of interaction between the end user and the database.

Answer: The type of interaction between the end user and the database that involves front-end applications is called indirect interaction. Another type of interaction between the end users and the database, called direct interaction, involves the end user communicating directly with the DBMS. Whereas indirect interaction typically requires very little or no database skill from the end user, the level of expertise and knowledge needed for direct interaction requires database-related training of the end users. The direct interaction requires that the end user knows how to issue commands to the specific DBMS. This typically requires that the end user knows the language of the DBMS.

Diff: 2 Page Ref: 3-4



11) Show a diagram that illustrates the principal activities in the process of the development of the database system.

Answer: Figure 1.5

Diff: 2 Page Ref: 4

12) Explain the iterative nature of the database requirements phase.

Answer: The guidelines and methods for the database requirements phase call for an iterative process. A smaller beginning set of requirements can be collected, defined, and visualized, and then discussed by the database developers and intended end users. These discussions can then lead into another iteration of collecting, defining, and visualizing requirements that gradually increases the first set of requirements. Even when a set of requirements is agreed upon within the database requirements collection, definition, and visualization steps, it can still be subject to change initiated by the other steps in the database development process. Instead of mandating the collection, definition, and visualization of all database requirements in one isolated process, followed by all other steps in the development of the database systems, the common recommendation is to allow refining and adding to the requirements after each step of the database development process. For example, a common practice in database projects is to collect, define, and visualize an initial partial set of requirements and, based on these requirements, create and implement a preliminary partial database model. This is followed by a series of similar iterations where the additional requirements are added (collected, defined, and visualized) and then used to expand the database model. The requirements can also be altered iteratively when other steps, such as the creation of front-end applications or actual database use, reveal the need for modifying, augmenting, or reducing the initial set of requirements.

Diff: 3 Page Ref: 5-6

13) Elaborate on why *implicit* requirement changes are not permitted.

Answer: Every time the set of requirements is changed, the conceptual model has to be changed accordingly, and the changes in the requirements must propagate as applicable through all of the subsequent steps: modeling, creating the database, creating front-end applications, deployment, use, and administration/maintenance. No implicit changes of requirements are permitted in any of the database development steps. For example, during the database implementation process a developer is not allowed to create in an ad hoc way a new database construct (e.g., a database table or a column of a database table) that is not called for by the requirements. Instead, if during the database implementation process it is discovered that a new construct is actually needed and useful, the proper course of action is to go back to the requirements and augment both the requirements document and the conceptual model to include the requirement for the new construct. This new requirement should then be reflected in the subsequently augmented database model. Only then should a new database construct actually be implemented.

Diff: 3 Page Ref: 6

14) What is the difference between conceptual and logical database modeling?

Answer: Logical database modeling refers to the creation of the database model that is implementable by the DBMS software. Logical database model is also known as an implementational database model. A conceptual database model is simply a visualization of the requirements, independent of the logic on which a particular DBMS is based. The conceptual model serves as a blueprint for the actual (logical) database model.

Diff: 2 Page Ref: 6

15) What is the difference between developing the initial and subsequent versions of the database system?

Answer: Unlike with the initial version, in the subsequent versions not all requirements will be collected from scratch. Original requirements provide the starting point for additions and alterations. Many of the additions and modifications result from observations and feedback by the end users during the use of the previous version, indicating the ways in which the database system can be improved or expanded. Other new requirements may stem from changes in the business processes that the database system supports, or changes in underlying technology.

Diff: 2 Page Ref: 7-8

16) List the general categories of people involved with database projects and systems.

Answer: Database analysts, designers, and developers. Front-end applications analysts and developers. Database administrators. Database end users.

Diff: 1 Page Ref: 8-9

17) Describe and illustrate the relationship between the operational and analytical information.

Answer: Analytical information is based on operational (transactional) information. For example, to create the analytical information showing a pattern of use of ATM machines at different times of the day, we have to combine numerous instances of transactional information resulting from individual ATM withdrawals. Similarly, to create the analytical information showing sales trends over various routes, we have to combine numerous instances of transactional information resulting from individual airline ticket purchases.

Diff: 3 Page Ref: 10