Chapter 5 Exercises

*For questions 1 – 3 give the formal name for the following practical components of the relational model...*

1. Table.
2. Column.
3. Row.
4. Includes a *name*, *data type*, *format*, and in some special cases a *unit of measurement* is referred to as the logical definition of this.

*For questions 5 & 6 please refer to the following denotation of the relation schema of R...*

*R(A1, A2, ..., An)*

1. What is **“R”** referred to as?
2. What is **“A1, A2, ..., An”** referred to as?
3. What is the degree (or arity) of the following relation schema for STUDENT?

*STUDENT(Ssn, Name, DateOfBirth)*

1. Which of the following describes the relation schema in general; Relatively Static or Constantly Changing?

*For questions 9 & 10 please refer to the following denotation of the relation state r of R...*

*r(R) = { t1, t2, ..., tm }*

*t = < v1, v2, ..., vn >*

1. What is **“{t1, t2, ..., tm}”** referred to as?
2. What must be true about the value v1 in terms of the dom(A1)?
3. Which of the following describes the relation state in general; Relatively Static or Constantly Changing?
4. Give one downside of NULL values and the relational model regarding arithmetic aggregations and comparisons.
5. State the key difference between the entity relationship and relational models in terms of how entities and relationships are represented in each (explain your answer).
6. What assumption states that only true facts about the universe are present within the extension (state) of the relation(s)?
7. Also known as schema-based constraints, and are characterized by being inherent in the data model?
8. Also known as explicit constraints, and can be directly expressed in the schemas of the data model, typically by specifying them in the data definition language (DDL)?
9. Also known as semantic constraints, and cannot be directly expressed in the schemas of the data model, hence they must be expressed and enforced by the application programs or in some other way?
10. This type of schema-based constraint specifies that within each tuple t, the value v of each attribute A must be an atomic value from domain dom(A).
11. This type of constraint can also be classified as what type of constraint (hint: It’s not schema-based)?
12. A subset of attributes S such that for tuples t1 and t2 the following invariant holds: t1[S] ≠ t2[S] is referred to as what?
13. This must always be true for which subset of attributes (according to the relational model)?
14. True or false, the set of attributes constituting a key is an attribute of the relation state r(R)?
15. When a relation schema has more than one key, one must be chosen to uniquely identify tuples. This is referred to as what special kind of key?
16. A relational database schema S is a set of relation schemas S = { R1, R2, ..., Rm } and what else?
17. The constraint stating that no primary key values can have NULL values is referred to as what?
18. These kinds of constraints typically arise from the relationships among entities represented by the relation schemas.

*For questions 27 – 30 please complete the following relational database schema S = { STUDENT, ENROLLMENT, COURSE } by specifying the constraints described in each question...*

**STUDENT**

|  |  |  |  |
| --- | --- | --- | --- |
| Ssn | Name | DateOfBirth | MentorSsn |

**ENROLLMENT**

|  |  |  |
| --- | --- | --- |
| Ssn | CourseId | StartDate |

**COURSE**

|  |  |  |
| --- | --- | --- |
| CourseId | Name | Description |

1. The Ssn attribute on the STUDENT relation is the primary key.
2. The Ssn attribute of the ENROLLMENT relation schema is a foreign key and references the Ssn attribute of the STUDENT relation schema.
3. The CourseId attribute of the ENROLLMENT relation schema is a foreign key and references the Ssn attribute of the COURSE relation schema.
4. The MentorSsn attribute of the STUDENT relation schema is a foreign key and references the Ssn attribute of the STUDENT relation schema.

*For questions 31 – 33 name the type of schema-based constraint that can be violated with each given operation (give a concrete example using the relational database schema S from questions 27 – 30)...*

1. Insert.
2. Update.
3. Delete.