Q3.1 Which conditions must hold in order for a table to be a relation?

1 Each column must have a name. Within one table, each column name must be unique.

2 Within one table, each row must be unique.

3 Within each row, each value in each column must be single valued. Multiple values of the content represented by the column are not allowed in any rows of the table.

4 All values in each column must be from the same (predefined) domain.

5 Order of columns is irrelevant.

6 Order of rows is irrelevant.

Q3.2 What is a primary key?

A column (or a set of columns) in a relation whose value is unique for each row; in case there are multiple candidates, a designer chooses one of the candidates to be the primary key

Q3.3 How is a regular entity with regular attributes mapped into a relation?

Each regular entity becomes a relation, and each regular attribute of a regular entity becomes a column of the newly created relation. If an entity has a single unique attribute, then that attribute becomes the primary key in the resulting mapped relation. In case the entity contains multiple unique attributes a designer chooses one of the candidates to be the primary key

Q3.4 How is a composite attribute mapped into a relation?

Each component of a composite attribute is mapped as a column of a relation, while the composite attribute itself does not appear in the mapped relation.

Q3.5 How is a unique composite attribute mapped into a relation?

Components of a composite attribute are mapped as columns of a relation that become either a composite primary key or a composite candidate (but not primary) key.

Q3.6 How is an optional attribute mapped into a relation?

When optional attributes are mapped into relations, the resulting optional columns are marked as (O).

Q3.7 Give a definition of the entity integrity constraint.

In a relational table, no primary key column can have null (empty) values.

Q3.8 What is a foreign key?

A column in a relation that refers to a primary key column in another (referred) relation.

Q3.9 How is a 1:M relationship between two entities mapped into a relational schema?

The relation mapped from the entity on the M side of the 1:M relationship has a foreign key that corresponds to the primary key of the relation mapped from the 1 side of the 1:M relationship.

Q3.10 How is an M:N relationship between two entities mapped into a relational schema?

In addition to the two relations representing the two entities involved in the M:N relationship, another relation is created to represent the M:N relationship itself. This new relation has two foreign keys, corresponding to the primary keys of the two relations representing the two entities involved in the M:N relationship. The two foreign keys form the composite primary key of the new relation.

Q3.11 How is a 1:1 relationship between two entities mapped into a relational schema?

In the same way as 1:M relationships. One of the resulting relations has a foreign key pointing to the primary key of the other resulting relation. When mapping 1:M relationships, we have to follow the rule that states that the primary key of the relation mapped from the 1 side becomes a foreign key of the relation mapped from the M side. In a 1:1 relationship, maximum cardinalities of both entities are 1. Therefore, we simply choose one of the mapped relations to have a foreign key referring to the primary key of the other mapped relation.

Q3.12 Give a definition of the referential integrity constraint.

In each row of a relation containing a foreign key, the value of the foreign key EITHER matches one of the values in the primary key column of the referred relation OR the value of the foreign key is null (empty).

Q3.13 How are candidate keys mapped into a relation?

Candidate keys that are not chosen as primary keys are marked as unique by showing the letter U in parentheses next to the names of unique non-primary key columns.

Q3.14 How is a multivalued attribute mapped into a relational schema?

Multivalued attribute are mapped as a separate relation that has a column representing the multivalued attribute and a foreign key column referring to the primary key of the relation resulting from the entity itself. Both of these columns form a composite primary key for the separate relation.

Q3.15 How is a derived attribute mapped into a relational schema?

Derived attributes are not mapped into the relational schema.

Q3.16 How is a 1:M unary relationship mapped into a relational schema?

The relation mapped from an entity involved in a 1:M unary relationship contains a foreign key that corresponds to its own primary key.

Q3.17 How is an M:N unary relationship mapped into a relational schema?

In addition to the relation representing the entity involved in a unary M:N relationship, another relation is created to represent the M:N relationship itself. This new relation has two foreign keys, both of them corresponding to the primary key of the relation representing the entity involved in the unary M:N relationship. Each of the foreign keys is used as a part of the composite primary key of the new relation.

Q3.18 How is a 1:1 unary relationship mapped into a relational schema?

The relation mapped from an entity involved in a 1:1 unary relationship contains a foreign key that corresponds to its own primary key.

Q3.19 How is a weak entity mapped into a relational schema?

The resulting relation has a composite primary key that is composed of the partial identifier and the foreign key corresponding to the primary key of the owner entity.

Q3.20 How is a ternary relationship mapped into a relational schema? A new relation is created with foreign keys corresponding to the primary keys of the relations representing the three entities involved in the ternary relationship.

Q3.21 List implicit constraints in the relational database model.

‐ Each relation in a relational schema must have a different name.

‐ Each relation must satisfy the following conditions:

o each column must have a different name

o each row must be unique.

o in each row, each value in each column must be single valued.

o all values in each column must be from the same predefined domain (this restriction is also known as domain constraint).

o the order of columns is irrelevant.

o the order of rows is irrelevant.

‐ Each relation must have a primary key, which is a column (or a set of columns) whose value is unique for each row (this restriction is also known as the primary key constraint).

‐ No primary key column can have null values (entity integrity constraint).

‐ In each row of a relation containing a foreign key, the value of the foreign key either matches one of the values in the primary key column of the referred relation or the value of the foreign key is null (referential integrity constraint).

Q3.22 What are user-defined constraints?

User-defined constraints are database constraints added by the database designers. They are specific to the database that is being developed.

Q3.23 What are business rules? Business rules are user-defined constraints that specify restrictions on resulting databases that are not a part of the standard notation for creating ER diagrams. Business rules can be added as notes accompanying the diagrams or they can be listed in separate documentation.

Q3.24 What is a designer-created primary key? A designer-created primary key is an additional column that is added to a relation to serve as the primary key. Often the designer-created primary key column is populated with the autonumber data type option that allows for automatic generation of consecutive numeric data values in the column.

Q3.25 What are the main reasons against creating a relational database model without first creating an ER model?

- ER modeling is more suited for visualization of the requirements

- Certain concepts can be visualized graphically only in ER diagrams

- Every attribute is mentioned only once in the ER diagram

- An ER model is a better communication and documentation device

MC1

|  |  |
| --- | --- |
| Investment Company |  |
| ICID | **ICName (U)** |
| 1 | First Invest |
| 2 | Second Invest |
| 3 | Third Invest |

|  |  |
| --- | --- |
| Invstcompany Location |  |
| icid(Fk) | **ICLocation** |
| 1 | First street |
| 2 | Second street |
| 3 | Third street |

|  |  |  |  |
| --- | --- | --- | --- |
| Mutual Fund |  |  |  |
| mfid | **MFName** | **MFIncDate** | **ICID(FK)** |
| M1 | First Mutual | 1/1/2016 | 1 |
| m2 | Second Mutual | 1/2/2016 | 2 |
| m3 | Third Mutual | 1/3/2016 | 3 |

|  |  |  |
| --- | --- | --- |
| Security |  |  |
| SecurityID | **SecurityName** | **SecurityType** |
| S1 | A | X |
| S2 | B | Y |
| S3 | C | Z |

|  |  |  |
| --- | --- | --- |
| Contains |  |  |
| MFID(FK) | **SecurityID(FK)** | **Amount** |
| M1 | S1 | 4 |
| M2 | S2 | 5 |
| M3 | S3 | 6 |

MC3

|  |  |
| --- | --- |
| Customer |  |
| CustID | **CustName** |
| 1 | Tom |
| 2 | Mark |
| 3 | Peter |

|  |  |
| --- | --- |
| Customer Phone |  |
| CustPhone | **CustID(FK)** |
| 456-3245673 | 1 |
| 464-4268324 | 2 |
| 246-4575868 | 3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Out Fit |  |  |  |  |
| OutFitID | **OutFitPrice** | **OutFitPDOC** | **CustID(FK)** | **DesID(FK)** |
| 4 | $235 | 2/3/2016 | 1 | 7 |
| 5 | $546 | 2/4/2016 | 2 | 8 |
| 6 | $23 | 2/5/2016 | 3 | 9 |

|  |  |  |
| --- | --- | --- |
| Tailoring Technician |  |  |
| TTSSN | **TTFName** | **TTLName** |
| 345-34-2345 | Harry | Potter |
| 746-34-5686 | Mary | Ann |
| 652-57-6786 | Doug | Frank |

|  |  |  |
| --- | --- | --- |
| Work On |  |  |
| OutFitID(FK) | **TTSSN(FK)** | **DateStarted** |
| 4 | 345-34-2345 | 1/5/2016 |
| 5 | 746-34-5686 | 1/6/2016 |
| 6 | 652-57-6786 | 1/7/2016 |

|  |  |  |  |
| --- | --- | --- | --- |
| Designer |  |  |  |
| DesID | **DesSSN(U)** | **DesFName** | **DesLName** |
| 7 | 564-75-2367 | Alex | Wang |
| 8 | 546-87-2346 | Ivy | McQueen |
| 9 | 123-68-2353 | Claire | Underwood |

|  |  |  |
| --- | --- | --- |
| Fashion Show |  |  |
| FSID | **FSDate** | **FSLocation** |
| x | 7/1/2016 | New York |
| y | 7/2/2016 | Paris |
| z | 7/3/2016 | Tokyo |

|  |  |
| --- | --- |
| Participates In |  |
| DesID(FK) | **FSID(FK)** |
| 7 | X |
| 8 | Y |
| 9 | Z |