1. a) What is a relation?

 a relationship exists between two tables when one of them has a foreign key that references the primary key of the other table.

b) Describe the difference between a relation instance (state) and a relation schema.

Relational schema: - Domain of the relationship, rarely change(almost fixed), size is fixed

Relation instance: - set of data recorders, continuously change, size is being grown

1. a) Describe Key, Composite Key, Candidate Key and Primary Key of a relation.

key attribute - Minimal set of attributes which uniquely identify an entity in the entity list

Composite Key - Sometimes, a group of attributes make up the key

Candidate Key: data uniquely identify by Multiple attributes. There can be multiple key attributes.

Primary key (PK) - Minimal set of attributes that uniquely identifies a row. This is how we can guarantee that all rows are unique A single and unique candidate key is designated as the primary key.

b) What is the difference between a candidate key and a super key?

Super Key is a set of attributes or columns that uniquely identifies each row table whereas, a candidate key is a set of attributes that recognizes the tuples in a relation, or table.

1. Explain what is meant by a foreign key. How do foreign keys of relations relate to primary keys? How do you give the Foreign Key Constraint?

Foreign key (FK) Set of attributes in a table that serves as a reference to the primary key of another table

A foreign key is a column or a set of columns in one table that references the primary key columns in another table. The primary key is defined as a column (or set of columns) where each value is unique and identifies a single row of the table.

The FOREIGN KEY constraint is used to prevent actions that would destroy links between tables. A FOREIGN KEY is a field (or collection of fields) in one table, that refers to the PRIMARY KEY in another table.

1. a) Discuss why it’s desirable to enforce Integrity Constraints.

• **DBMS must prevent entry of incorrect information**

• To prevent: Constraints / conditions are specified on a relational schema = ICs

• Database which satisfies all constraints specified on a database schema is a legal instance.

• DBMS enforces constraints - permits only legal instances to be stored

• When the application is run the DBMS checks for the violation and disallows the changes to the

data that violates the specified IC

b) List the available Integrity Constraints and describe each.

• Domain constraints: value in the Column must be drawn from the domain associated with that column.

* Key constraints: Two tuples in a legal instance cannot have identical values in all the fields of a key
* Entity Integrity Constraints: states that primary key values cannot be null.
* Reference integrity constraints: The value in the foreign key column ( can be either: – a value of an existing primary key in the referenced relation or a null

5. Refer the database schema and the sample data given.

Student

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID | Name | Date of Birth | Address | Course |

Course

|  |  |  |
| --- | --- | --- |
| ID | Name | Description |

**Student**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Name** | **Date of Birth** | **Address** | **Course** |
| IT11223311 | Sunil Perera | 9/8/1988 | Colombo | IT |
| IT11223322 | Asanka Soyza | 4/5/1988 | Galle | IT |
| IT11223333 | Nimalie De Silva | 3/8/1990 | Colombo | CSN |
| IT11223344 | Anjana Perera | 7/3/1989 | Kandy | IT |
| IT11223355 | Sarath Perera | 1/10/1988 | Matara | CSN |

**Course**

|  |  |  |
| --- | --- | --- |
| **ID** | **Name** | **Description** |
| IT | Information Technology | A course about important concepts related to Information Technology |
| CSN | Computer Systems and Networking | A course about important concepts related to Computer Science mainly focusing on Networking |

1. Identify possible DB operations in which the Referential Integrity Constraint can get violated.

– Insert : inserts a new tuple(s) into a relation.

– Delete : delete tuple(s) in a relation.

– Update : changes the values of some attributes in existing tuples

1. Considering the sample data identify an example situation in which the constraint can get violated.

Insert: - when we try to insert data to student table, Course column referenced ID column in Course table. Therefore, we cannot insert data to Course column in Student table, if that data is not available in ID column in Course Table.

INSERT INTO Student VALUES (‘IT123456’, ‘aaaaaa’,’20/10/1985’,’Negombo’,’DS’);

This query is as an example for Insert Constraint.

Delete: - when we try to delete as below

DELETE FROM Course WHERE ID = ‘IT’;

We cannot execute this query. Because of this Course ID column is referencing Course column in Student table.

Update: - Update Constraint also same as insert.

UPDATE Student SET Course = ‘DS’ WHERE ID=’ IT11223333’;

This time also we get error because we can not update foreign key attribute column if that data does not exist data in referenced primary key column

c) In case of a violation of the above constraint what are the actions you can specify for the DBMS to take.

d) How and where can you specify it.

This method referencing column data get NULL

Text, letter

Description automatically generated

This is for first delete student table row

Text

Description automatically generated

Text

Description automatically generated

6. Refer below schema and answer the following questions.

Employee (employee\_ID, Name, Address, NIC, Driving\_Licence\_No, Position, DateOfBirth)

1. Identify possible candidate key(s).

employee\_ID, NIC, Name+Address,

1. Identify a suitable primary key.

employee\_ID

1. Are there any Composite Keys?

Yes. NIC, Name+Address.

1. Identifying a Super Key.

Name+Address+NIC