

1)

Domain: All possible values for an attribute including data types, format and constraints.

Attribute: Property of the relation table. It specifies the types of data.

ntuple: ordered set of n values each corresponding to n defined attributes in the relation schema.

relation schema: the structure of relation table, including its name and attribute.

relation state: The actual data in the relation table, consists of set of tuple.

2)

Superkey: A set of one or more attributes that uniquely identifies each tuple in a relation

key: minimal set of one or more attributes that uniquely identifies each tuple and no attributes can be removed without losing uniqueness.

3)

The domain of an attribute is the set of all possible atomic values that the attribute can take, defined by its datatype, format and other constraints. Domain constraint ensures that the values of an attribute fall within that set.

key constraint ensures that each tuple in a relation is uniquely identifiable using one or more attributes. No two rows can have the same value for the key.

Entity Integrity Constraint ensures each tuple is uniquely identifiable and primary key of a relation can not be null.

Referential integrity ensures that a foreign key in one table matches a primary key in another table.

4)

a) In DEPT-LOCATION the Dnumber attribute expects an integer but a string was given which violate the domain constraint. The value 'D1' doesn't match any existing Dnumber in DEPARTMENT table, which violates the referential integrity constraint. Define Dnumber as integer in the schema so database would reject it.

b) Dnumber = 6 does not exist in the Department table, violating referential integrity constraint. Enforce integrity constraint by declaring in

DEPT-LOCATIONS table as foreign key.

c) Entity integrity violation occurs while assigning null value, as null violates the uniqueness and nonnull requirements of primary key.

d) Referential integrity constraint occurs here.
No 3 for Dnumber is referenced to DEPARTMENT.
Declare Dno in the employee table as foreign key to prevent violation.

e) Deleting the employee Franklin T Wong from the employee table would violate referential integrity constraint. As it would affect all the rows having T Wongs information.
To stop violation set mgrsnn, esn (dependent) to null and delete related tuples in other tables.

f) no violation. as ESSN and Dno exists in other tables and no other issues.

g) key constraint violation as Dnumber is primary key in the project table and '20' already exists on the attribute. To prevent violation declare Dnumber as primary key.

'Product x' Dnumber is '1' which is referenced in the works-on table, if the value is updated, then the referencing table value will not be an existing value from the referenced table anymore causing referential integrity violation happens. To prevent, declare column as foreign key, also specify what will happen cascade or set null.