1. Define the following:
2. Attribute: An attribute is a database field or an independent column in a relation(table). It describes the instances in the row of a database. For example: In a relation **employee**, person-id, person, street, city are attributes.
3. Transaction Management: A transaction is a set of operations that perform a single function in a database. Transaction manager is one of the components in database engine. It ensures that the database remains consistent even after the system failures and transaction failures.
4. DBA: Data-Base Administrators. DBAs are one of the users of database. They maintain the database by directing or performing activities to keep the data secured using certain administration tools.
5. Data Mining: Data mining is the process of analysing large quantity of data which is stored in the database or data warehouse using various data mining techniques.
6. DDL: Data Definition Language is a specific notation for defining the database schema. It defines the schema for all the relations, domain values of attributes, integrity constraints and authorizations.
7. Domain: Domain is the set of allowed values for each attribute. All the attribute values must be atomic. Each attribute has a special value “null” which indicates that the value is unknown.
8. Foreign Key: An attribute in one relation must appear as primary key in another relation. In the following, department\_name is the foreign key in works relation referencing department relation.

works (person-id, person, department\_name, salary)

department (department-id, department\_name, building)

1. Logical Schema: Logical schema is the overall logical structure of the database. Example, the database consists of information about works and department relation and the relationship between them.
2. Null value: The “NULL” value is used to represent a missing or an unknown value. It is a field with no value, or it appears blank. “Null” values cause complications in many operations. It must be dealt carefully.
3. Relation instance: It is the actual contents of the database relation at a particular point in time. It is analogous to the values.

2) Explain the difference between a superkey, a candidate key, and a primary key.  What factors do you need to consider when selecting the primary key?

**a. Super key:** A super key k is an/are attribute(s) which is/are enough to identify a tuple t uniquely in a relation r.

Example: Student ID in students’ relation is a super key whereas the student name is not a super key as there will be more than one student with the same name. Student ID and Name can be super keys.

**b. Candidate key:** A candidate key is any super key that is minimal.

Example: Student ID is a candidate key.

**c. Primary key:** One of the candidate keys is selected to be primary key. We must choose one that changes rarely.

Example: Student ID can be a primary key with which a student is identified.

5) Interpret relational algebra by writing the English equivalence.

MyUniversity (primary keys are in italic)

     classroom(building, room\_number, capacity)

     department(dept\_name, building, budget)

     course(course\_id, title, dept\_name, credits)

     instructor(id, name, dept\_name, salary)

     section(course\_id, sec\_id, semester, year, building, room\_number, time\_slot\_id)

     teaches(id, course\_id, sec\_id, semester, year)

     student(id, name, dept\_name, tot\_cred)

     takes(id, course\_id, sec\_id, semester, year, grade)

     advisor(s\_id, i\_id)

     time\_slot(time\_slot\_id, day, start\_time, end\_time)

     prereq(course\_id, prereq\_id)