1 Possibly Useful Information

- **Canonical SQL Statement:**
  
  ```sql
  SELECT <attributes>
  FROM <tables>
  WHERE <conditions>
  GROUP BY <attributes>
  HAVING <conditions>
  ```

- **Functional Dependency (FD):** For a relation \( R \), and sets of attributes \( X \) and \( Y \), the functional dependency \( X \rightarrow Y \) holds if for any \( t_1, t_2 \in R \), \( t_1[X] = t_2[X] \implies t_1[Y] = t_2[Y] \).

- **Armstrong’s Axioms:** Let the \( A_i \)s, \( B_j \)s, and \( C_k \)s be attributes:
  
  1. *Split/Combine:* If \( A_1, ..., A_n \rightarrow B_j \) for \( j = 1, ..., m \), then this is equivalent to \( A_1, ..., A_n \rightarrow B_1, ..., B_m \) and vice-versa
  2. *Reduction/Trivial:* \( A_1, ..., A_n \rightarrow A_i \) for any \( i = 1, ..., n \)
  3. *Transitive Closure:* If \( A_1, ..., A_n \rightarrow B_1, ..., B_m \) and \( B_1, ..., B_m \rightarrow C_1, ..., C_p \) then \( A_1, ..., A_n \rightarrow C_1, ..., C_p \)

- **Closure:** Given a set of attributes \( X \) and a set of FDs \( F \), the closure \( X^+ \) is the set of all attributes \( y \) such that \( X \rightarrow y \).

- **Superkey:** Given a relation \( R \), a superkey is a set of attributes \( X \) such that \( X^+ \) is equal to the full set of attributes of \( R \).

- **Key:** A key is a minimal superkey, i.e. a superkey where no subset of it is also a superkey.

- **Boyce-Codd Normal Form (BCNF):** A relation \( R \) is in BCNF if for all sets of attributes \( X \), either \( X^+ = X \) (\( X \) is trivial) or \( X^+ = X \) the set of all attributes (\( X \) is a superkey).

- **Conflicts:** Two actions conflict if they are part of different TXNs, involve the same variable, and at least one of them is a write.

- **Serializable:** A schedule is serializable if it is equivalent to some serial ordering.

- **Multi-Value Dependency (MVD):** Given a relation \( R \) with a set of attributes \( A \), two sets of attributes \( X, Y \subseteq A \), we say that the MVD \( X \rightarrow Y \) holds if for any tuples \( t_1, t_2 \in R \) such that \( t_1[X] = t_2[X] \), there is a tuple \( t_3 \) such that:
  
  - \( t_3[X] = t_1[X] \)
  - \( t_3[Y] = t_1[Y] \)
  - \( t_3[A \setminus Y] = t_2[A \setminus Y] \)

- **ER Diagrams:**
  
  - Entities are contained in rectangles
  - Attributes are contained in circles
  - Relationships are contained in diamonds
  - Primary Key Attributes are underlined
  - Relationships with at most one instance of an entity connect with arrows
  - Relationships with at least one instance of an entity connect with bold lines