Select Distinct cannot sort an expression not in select SELECT [ ALL | DISTINCT ] [TOP ( expression ) [PERCENT] [ WITH TIES ] ] < select\_list > [ FROM { <table\_source> } [ ,...n ] ] [ WHERE <search\_condition> ] [ GROUP BY { column\_expression } [ ,...n ] ] [ HAVING < search\_condition > ] [ORDER BY { order\_by\_expression [ ASC | DESC ] } [ ,...n ] [OFFSET { offset\_count\_expr } { ROW | ROWS } [ FETCH { FIRST | NEXT } { fetch\_count\_expr } { ROW | ROWS } ONLY ] ] ]

1. () 2. \*, /, % 3. +, - 4. =, >, <, >=, <=, <> 5. NOT 6. AND 7. BETWEEN, IN, LIKE, OR 8. = (Assignment)

**Armstrong’s** Rules – 1. **Splitting rule and Combining rule**. A1, A2,.. An -> B1, B2, Bn == A1,A2,..An ->B1,A1,A2,..An ->Bn

**Trivial** Rule -> A,B,C -> A..A,B,C -> B etc. **Transitive Closure Rule**: If A1, A2,.. An -> B1, B2, Bn and B1, B2, Bn -< C1, C2, CN Then A1, A2, AN -> C1, C2, CN Given a set of attributes A1, …, An the closure {A1, …, An}+ = the set of attributes B such that A1, …, An → B. A **superkey** is a set of attributes A1, ..., An s.t. for any other attribute B, we have A1, ..., An → B. A **key** is a minimal superkey.. **If X+ =** all attributes then X is a superkey.

A relation R is in BCNF if and only if for every functional dependency X → A: •X → A is a trivial functional dependency Or •X is a superkey for R. A **UPDATE** statement updates all rows as an atomic operation. **WHAT ARE INDEXES?** Structures to allow quick “look-ups” of the requested rows. Physically use B-Trees, Index keys are used for root and intermediate level pages, Other data in the leaf level pages. CLUSTERED INDEXES – Define how the data is physically stored for a table, the leaf-level pages contain all data, CAN ONLY HAVE ONE CLUSTERED INDEX per table, A table without a clustered index is a “heap” **Nonclustered Indexes** – Can have multiple nonclustered indexes, The leaf-level pages contain references to the rows in the clustered index, and may contain copies of other columns, called “include columns”. Both Unique and Filtered Indexes are useful for enforcing uniqueness on only non-null values, and only active or non-“removed” rows. **ACID Properties** •Atomicity - All or nothing will succeed •Consistency - Ensures one valid state to another •Isolation - Concurrent transactions are independent

•Durability - Committed changes are not lost. **Isolation Levels –** Read Uncommitted – no data consistency, uses no shared locks. Read Committed – Prevents dirty reads. Repeatable Read – prevents dirty and non-repeatable reads. Serializable – prevents all consistency issues, including phantom rows. SNAPSHOT ISOLATION LEVEL – Same level of consistency as serializable, writers don’t block readers, readers don’t block writers, much improved concurrency. Better consistency and concurrency at a cost. **Transaction Log,** Changes are recorded in the transaction log before written to disk, The log is necessary to provide durable and atomic transactions. A and D of ACID. A subquery can have an ORDER BY but it is only used when a TOP clause is specified. In evaluating the functional dependencies and closures of a relation R, which of the following may be true of R if R is in Boyce-Codd Normal Form? **One** or more of its functional dependencies may be a trivial functional dependency, **For** one or more of its functional dependencies X -> Y, X may be a superkey for R. **For** one or more sets of its attributes X, the closure of X is X itself, i.e. X+ = X. **For** one or more sets of its attributes X, the closure of X contains all attributes, i.e. X+ = [all attributes].**Which of the following are true of a transaction log?** Circle all that apply: **Changes** are recorded in the transaction log before written to disk, **The** transaction log is necessary to provide durable transactions, **the** transaction log is necessary to provide atomic transactions. **According** to the standard, which of the following are possible result types of a subquery? **Scalar value, Table Valued, Multi-valued.**

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