Course Name: **A Level (1ˢᵗ Sem)**   Subject : **Introduction to DBMS**

Topic: **FD – Closure of Set of FDs (Part 5)**   Date: **23-Apr-2020**

Closure of Set of Functional Dependencies

Let F be a set of functional dependencies on a relational schema R, **the closure of F denoted by F⁺ is the set of all functional dependencies logically implied by F.** Given F, we can define F⁺ directly from the formal definition of functional dependency.

We can use Armstrong' axioms and other rules of inference to find logically implied functional dependencies (F⁺) from given set of FDs (F).

Q. Suppose, we are given a relational schema R (A, B, C, G, H, I) and set of functional dependency F:

$$F \{ A \rightarrow B,$$
$$A \rightarrow C,$$
$$CG \rightarrow H,$$
$$CG \rightarrow I,$$
$$B \rightarrow H \}$$

Compute the closure of above given set F. (i.e. what others FD can be derived?)

Solution:

From above given set F of functional dependencies, we can conclude following more functional dependencies set (F+) :

- **A →H**

  [Using **transitivity** properly of Armstrong's axioms, It derives   **A →H**   since A → B and B → H hold in the relation]

- **CG → HI**

  [Since CG → H and CG → I hold in the relation, It derives **CG → HI** using **Union rule**]

- **AG → I**

  [Since A → C and CG → I hold in the relation, It derives **AG → I** using **Pseudo Transitivity rule**]

- **AG → H**

  [Since A → C and CG → H hold in the relation, It derives **AG → H** using **Pseudo Transitivity rule**]

Therefore F+ { A →H , CG → HI, AG → I, AG → H }

Exercise:

1. Proof the Pseudo Transitivity rule? How it can be derived using Armstrong's axioms?

2. Compute the closure (F^+) of the following set F of functional dependencies for relational schema r (A, B, C, D, E):

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$