Amstrong’s Axioms

Amstrong's Axioms

- 1.Reflexivity if $Y \subseteq X$ then $X \rightarrow Y$
- 2.Augmentation if $X \rightarrow Y$ then $XZ \rightarrow Y$ and /or $XZ \rightarrow YZ$
- 3.Transitivity if $X \rightarrow Y$ and $Y \rightarrow Z$ then $X \rightarrow Z$
- 4.Psuedo transitivity if $X \rightarrow Y$ and $YW \rightarrow Z$ then $XW \rightarrow Z$
- 5.Union $X \rightarrow Y$ and $X \rightarrow Z$ then $X \rightarrow YZ$
- 6.Decomposition If $X \rightarrow YZ$, then $X \rightarrow Y$ and $X \rightarrow Z$

1.Reflexivity if $Y \subseteq X$ then $X \rightarrow Y$

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a1	b2	c3	d2	e3
a3	b3	c4	d2	e4
a4	b4	c5	d4	e5

1.Since $A \subseteq AB$, $AB \rightarrow A$

2.Since $B \subseteq AB$ then $AB \rightarrow B$

3.Since $AB \subseteq AB$, Then $AB \rightarrow AB$

2.Augmentation if X→Y then XZ→Y and /or XZ→YZ

1.IF C→A THEN CB→ A

AND CB→AB

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a1	b2	c3	d2	e3
a3	b3	c4	d2	e4
a4	b4	c5	d4	e5

4.Psuedo transitivity if X→Y and YW→Z then XW→Z

If C→B AND
BA→D
then
CA→D

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a1	b2	c3	d2	e3
a3	b3	c4	d2	e4
a4	b4	c5	d4	e5

5.Union X→Y and X→Z then X→YZ

1.iF C→A AND C→B THEN

C→AB

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a1	b2	c3	d2	e3
a3	b3	c4	d2	e4
a4	b4	c5	d4	e5

6.Decomposition If $X \rightarrow YZ$, then $X \rightarrow Y$ and $X \rightarrow Z$

1.iF $C \rightarrow DE$ then

$C \rightarrow D$ As well as $C \rightarrow E$

A	B	C	D	E
a1	b1	c1	d1	e1
a2	b2	c2	d2	e2
a1	b2	c3	d2	e3
a3	b3	c4	d2	e4
a4	b4	c5	d4	e5

Exercises on Inference rules(Amstrongs axioms)

- Q1. Given the set $F=\{A \rightarrow B, C \rightarrow X, BX \rightarrow Z\}$ Derive $AC \rightarrow Z$

Exercises on Inference rules(Amstrongs axioms)

- Q1. Given the set F={A→B,C→X,BX→Z} Derive AC→Z

Answer

A→B (1)

<u>BX→Z (2)</u>

- AX→Z (3) (psuedotransitivity rule (1) and(2))
- C→X (4)

<u>AX→Z (5)</u> psuedotransitivity rule (3) and(4))

CA→Z (6)

CA→Z means AC→Z

Q2.F={A→B,C→D}With C⊆B,Derive A→D

- A-→B (1)
- B→C (2) (GIVEN
- A→C (3) (TRANSITIVITY (1) AND (2))
- C→D (4)
- A→D (5) (TRANSITIVITY (3) AND (4))

Redundant FDs

- Given a set F of functional dependencies, A→B of F is said to be redundant with respect to the FDs of F iff A→B can be derived from set of FDs F-{A→B}

- A→B can be derived from set of functional dependencies not including A→B

Given a set F={X→YW,XW→Z,Z→Y,XY→Z}.Determine if the functional dependencies XY→Z is redundant in F?

- Step 1:Remove XY→Z from F
- New F1={X→YW,XW→Z,Z→Y}
- Step 2, Using F1, derive XY→Z
- X→YW (1)
- XW→Z (2)
- Z→Y (3)
- By Applying decomposition rule on (1) we get
- X→Y (4)
- X→W(5)

- X→W(5)
- XW→Z   (2)
- XX→Z(Psuedotransitivity (5) and (2))
- X→Z   (6)
- **XY→Z   (augmentation rule on (6))**