

Database Systems

Mid II Practice



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Question 1

Functional Dependencies

$A \rightarrow BCDEFGH$

$BC \rightarrow ADEFGH$

$E \rightarrow F$

$G \rightarrow B$

$C \rightarrow H$

$H \rightarrow IJ$

Candidate Keys

$A^+ = ABCDEFGHIJ$

$BC^+ = ABCDEFGHIJ$

$GC^+ = ABCDEFGHIJ$

Prime Attributes

A,B,C,G

Non-Prime Attributes

D,E,F,H,I,J

Normalization of R(ABCDEFGHIJ)

1st NF

Since values are not provided, the relation is assumed to be already in 1NF form.

2nd NF

Finding partial dependencies

There are no partial dependencies.

3rd NF

Finding transitive dependencies. Following TDs are identified:

$E \rightarrow F$

$C \rightarrow H$

$H \rightarrow IJ$

R(ABCDEFGHIJ) is decomposed as follows.

Relation	Candidate Key	Functional Dependencies
R1(ABCDEG)	A and BC	$A \rightarrow BCDEG$ $G \rightarrow B$ $BC \rightarrow ADEG$
R2(EF)	E	$E \rightarrow F$
R3(CH)	C	$C \rightarrow H$
R4(HIJ)	H	$H \rightarrow IJ$

BCNF

Finding non-trivial dependencies. Following NTDs are identified in R1 only:

$G \rightarrow B$

R(ABCDEG) is decomposed as follows.

Relation	Candidate Key	Functional Dependencies
R1(ACDE)	A	$A \rightarrow CDE$
R2(GB)	G	$G \rightarrow B$
R3(EF)	E	$E \rightarrow F$
R4(CH)	C	$C \rightarrow H$
R5(HIJ)	H	$H \rightarrow IJ$