


LAB 2

RELATIONAL DATABASE

DBI05

Fullname: *Phạm Tuấn Anh*Student ID: *SE192861*ID Group: *SE1805***Answer sheet:**

	Q1 (2 marks)	Q2 (2 marks)	Q3 (2 marks)	Q4 (4 marks)
What is your answer 	Fmin: $\{A \rightarrow B, A \rightarrow C, BD \rightarrow E, E \rightarrow G, CG \rightarrow H, CG \rightarrow I\}$ s	Candidate Key: $\{AD\}$	R is in 1NF only	R1(A,B,C), R21(B,D,E), R221(C,G,H,I), R222(A,B,D,G)

Consider relation: $R = (A, B, C, D, E, G, H, I)$ with the set of functional dependencies: $F = \{A \rightarrow BC, BD \rightarrow E, AH \rightarrow C, E \rightarrow G, CG \rightarrow HI\}$

- Find the minimal cover
- Find all candidate keys.
- Identify the best normal form that R satisfies
- If the relation is not in 3NF, decompose it until it becomes 3NF (or BCNF).
At each step, identify a new relation, decompose and re-compute the keys and the normal forms they satisfy.

SOLUTIONS:

- Find the minimal cover:

Step 1:

 $F: \{A \rightarrow BC, BD \rightarrow E, AH \rightarrow C, E \rightarrow G, CG \rightarrow HI\}$ $F': \{A \rightarrow B, A \rightarrow C, BD \rightarrow E, AH \rightarrow C, E \rightarrow G, CG \rightarrow H, CG \rightarrow I\}$

Step 2:

 $BD \rightarrow E$: Neither $B \rightarrow E$ nor $D \rightarrow E$ holds \rightarrow Keep $BD \rightarrow E$ $AH \rightarrow C$: $A \rightarrow C$ already exists \rightarrow H is redundant \rightarrow Remove $AH \rightarrow C$ $CG \rightarrow H$ and $CG \rightarrow I$: Neither $C \rightarrow H/I$ nor $G \rightarrow H/I$ holds \rightarrow Keep both

Step 3:

 $A \rightarrow B$: Not redundant (A^+ without it = $\{A, C\}$) $A \rightarrow C$: Not redundant (A^+ without it = $\{A, B\}$) $BD \rightarrow E$: Not redundant (BD^+ without it = $\{B, D\}$) $E \rightarrow G$: Not redundant (E^+ without it = $\{E\}$) $CG \rightarrow H$: Not redundant (CG^+ without it = $\{C, G, I\}$) $CG \rightarrow I$: Not redundant (CG^+ without it = $\{C, G, H\}$)Fmin: $\{A \rightarrow B, A \rightarrow C, BD \rightarrow E, E \rightarrow G, CG \rightarrow H, CG \rightarrow I\}$ **Q2:**

Step 1:

SRC: A, D

MIDDLE: B, C, E, G, H, I

Step 2:

 $\{AD\}^+$:

Start: AD

$A \rightarrow B$: ABD
 $A \rightarrow C$: ABCD
 $BD \rightarrow E$: ABCDE
 $E \rightarrow G$: ABCDEG
 $CG \rightarrow H$: ABCDEGH
 $CG \rightarrow I$: ABCDEGHI

Step 3:

$\{A\}^+ = ABC \neq R$

$\{D\}^+ = D \neq R$

Candidate Key: $\{AD\}$

Q3:

Partial dependencies on $\{AD\}$:

$A \rightarrow B$ (2NF)

$A \rightarrow C$ (2NF)

Conclusion: R is in 1NF only

Q4:

First (remove $A \rightarrow B$, $A \rightarrow C$):

R1(A,B,C) with $A \rightarrow B$, $A \rightarrow C$

R2(A,D,E,G,H,I) with $BD \rightarrow E$, $E \rightarrow G$, $CG \rightarrow H$, $CG \rightarrow I$

R1:

Key: A

BCNF

R2:

Key: AD

$BD \rightarrow E$: BD is not a superkey \rightarrow BCNF

Second (remove $BD \rightarrow E$):

R21(B,D,E) with $BD \rightarrow E$

R22(A,B,D,G,H,I) with $E \rightarrow G$, $CG \rightarrow H$, $CG \rightarrow I$

R21:

Key: BD

BCNF

R22:

Key: AD

$CG \rightarrow H$, $CG \rightarrow I$: CG is not a superkey \rightarrow BCNF

Third (remove $CG \rightarrow H$, $CG \rightarrow I$):

R221(C,G,H,I) with $CG \rightarrow H$, $CG \rightarrow I$

R222(A,B,D,G) (no FDs)

R1(A,B,C) with $A \rightarrow B$, $A \rightarrow C$ (BCNF)

R21(B,D,E) with $BD \rightarrow E$ (BCNF)

R221(C,G,H,I) with $CG \rightarrow H$, $CG \rightarrow I$ (BCNF)

R222(A,B,D,G) (no FDs, BCNF)