

# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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## Experiment 8

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### 1. Question:

**Relation R(ABCDEFGHI) having dependencies as:**

**$AB \rightarrow C$**

**$BD \rightarrow EF$**

**$AD \rightarrow GH$**

**$A \rightarrow I$**

**Highest normal form? C.K set?**

**Ans:**

Relation:  $R(ABCDEFGHI)$ , FDs:  $AB \rightarrow C, BD \rightarrow EF, AD \rightarrow GH, A \rightarrow I$

Candidate Key: Try  $ABD \rightarrow ABD^+ = ABCDEFGHI = R$  Minimal  $\rightarrow$  C.K. = {ABD}

Prime attributes: A, B, D; Non-prime: C, E, F, G, H, I

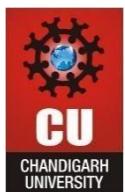
1NF: All attributes atomic

2NF check:  $AB \rightarrow C, BD \rightarrow EF, AD \rightarrow GH, A \rightarrow I \rightarrow$  partial dependencies exist Violates 2NF

3NF check: 2NF violated  $\rightarrow$  3NF violated

Highest NF = 1NF, C.K. = {ABD}

Candidate Key = {ABD}



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**Question 2:**

**Relation R(ABCDE) having dependencies as:**

**$AB \rightarrow CD$**

**$D \rightarrow A$**

**$BC \rightarrow DE$**

**Highest normal form? C.K set?**

Relation:  $R(ABCDE)$ , FDs:  $AB \rightarrow CD, D \rightarrow A, BC \rightarrow DE$

Candidate Key: Try  $BD \rightarrow BD^+ = B, D \rightarrow A(D \rightarrow A), C(BC \rightarrow DE), E BD^+ = ABCDE = R \rightarrow$  C.K. = {BD}

Prime attributes: B, D; Non-prime: A, C, E

1NF: All attributes atomic

2NF check: Candidate key BD  $\rightarrow$  no partial dependency (all FDs have whole key or non-prime determinant) 2NF satisfied

3NF check:  $D \rightarrow A$ , D is part of candidate key? D alone  $\rightarrow$  non-prime depends on prime (A) violates 3NF? Wait, A is non-prime, D is prime  $\rightarrow$  3NF allows if determinant is prime 3NF satisfied

Highest NF = 3NF, C.K. = {BD}

## ◊ Non-Prime Attributes

**Attributes not part of any candidate key.**

**Ans: D,E**

Final Answer (Exam-Ready)



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- Candidate Keys: {AC, BC}
- Prime Attributes: A, B, C
- Non-Prime Attributes: D, E

## Question 4

Consider a relation R having attributes

R(ABCDEF), functional dependencies are given below:

- $A \rightarrow BCD$
- $BC \rightarrow DE$
- $B \rightarrow D$
- $D \rightarrow A$

Identify the set of candidate keys possible in relation R.

List all the set of prime and non-prime attributes.

## Answer (In Short)

Candidate Keys:

- AF, DF

Prime Attributes:

- A, D, F

Non-Prime Attributes:

- B, C, E

5.

Relation R(ABCDE) having dependencies as:

- $CE \rightarrow D$
- $D \rightarrow B$
- $C \rightarrow A$

Find:

- Highest Normal Form
- Candidate Key (C.K) set



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From  $CE^+ = \{C, E, D, B, A\}$ , all attributes are obtained  $\Rightarrow C, E$  are the candidate keys.

**Prime attributes:** C, E

**Non-prime attributes:** A, B, D

$C \rightarrow A$  and  $D \rightarrow B$  are partial dependencies on the key CE

Hence, relation is in **1NF only**

8.

Relation R(ABCDEF) having dependencies as:

- $AB \rightarrow C$
- $DC \rightarrow AE$
- $E \rightarrow F$

**Find:**

- Highest Normal Form
- Candidate Key (C.K) set

From  $BD^+ = \{A, B, C, D, E, F\}$ , all attributes are obtained

Hence, BD is the candidate key

**Prime attributes:** B, D

Dependency  $E \rightarrow F$  is a transitive dependency on the key

Therefore, the relation is in **2NF (not in 3NF)**