

# **Dhirubhai Ambani Institute of Information and Communication Technology**



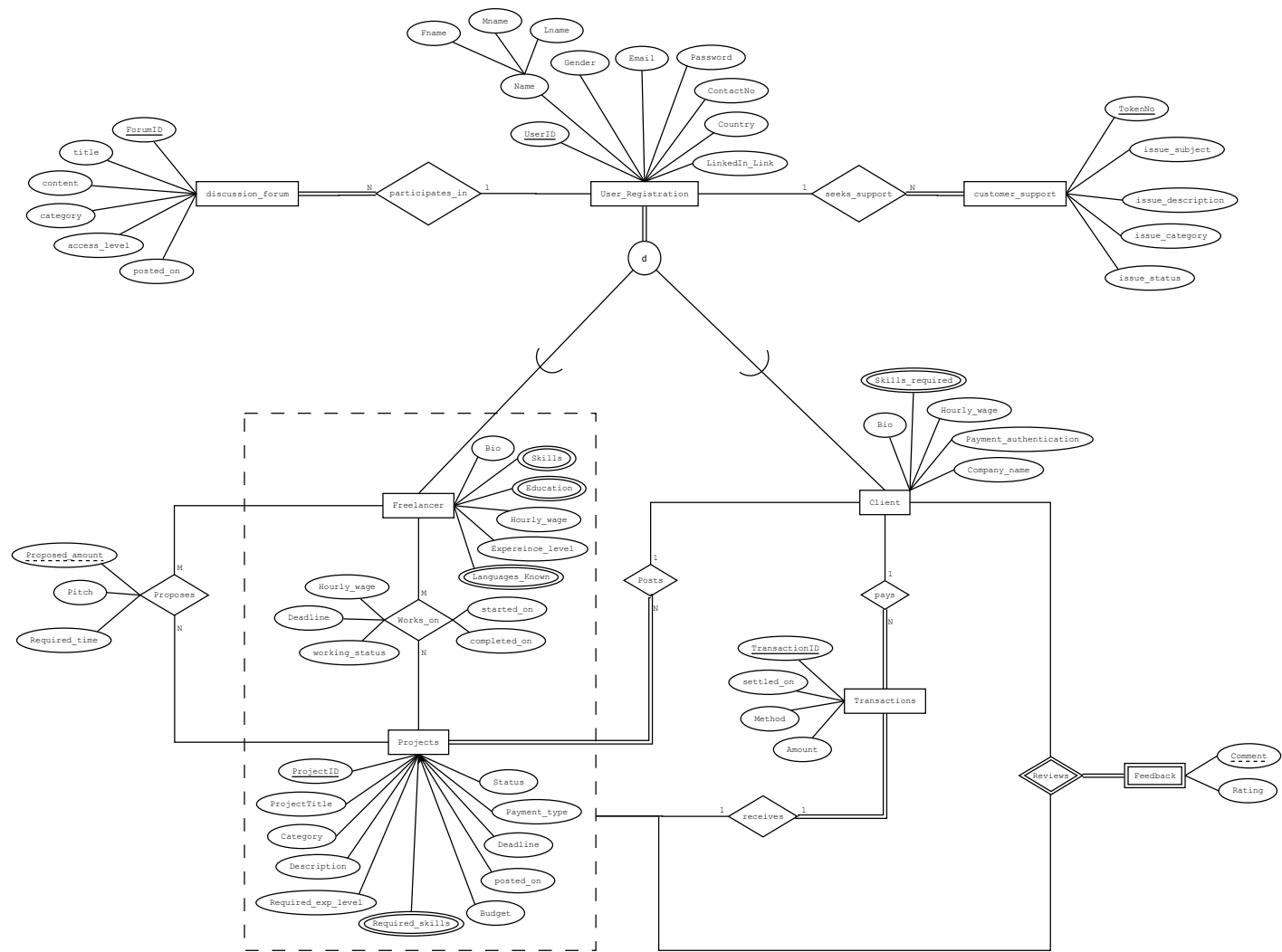
## **IT214 – Database Management System Database of Freelancing Website**

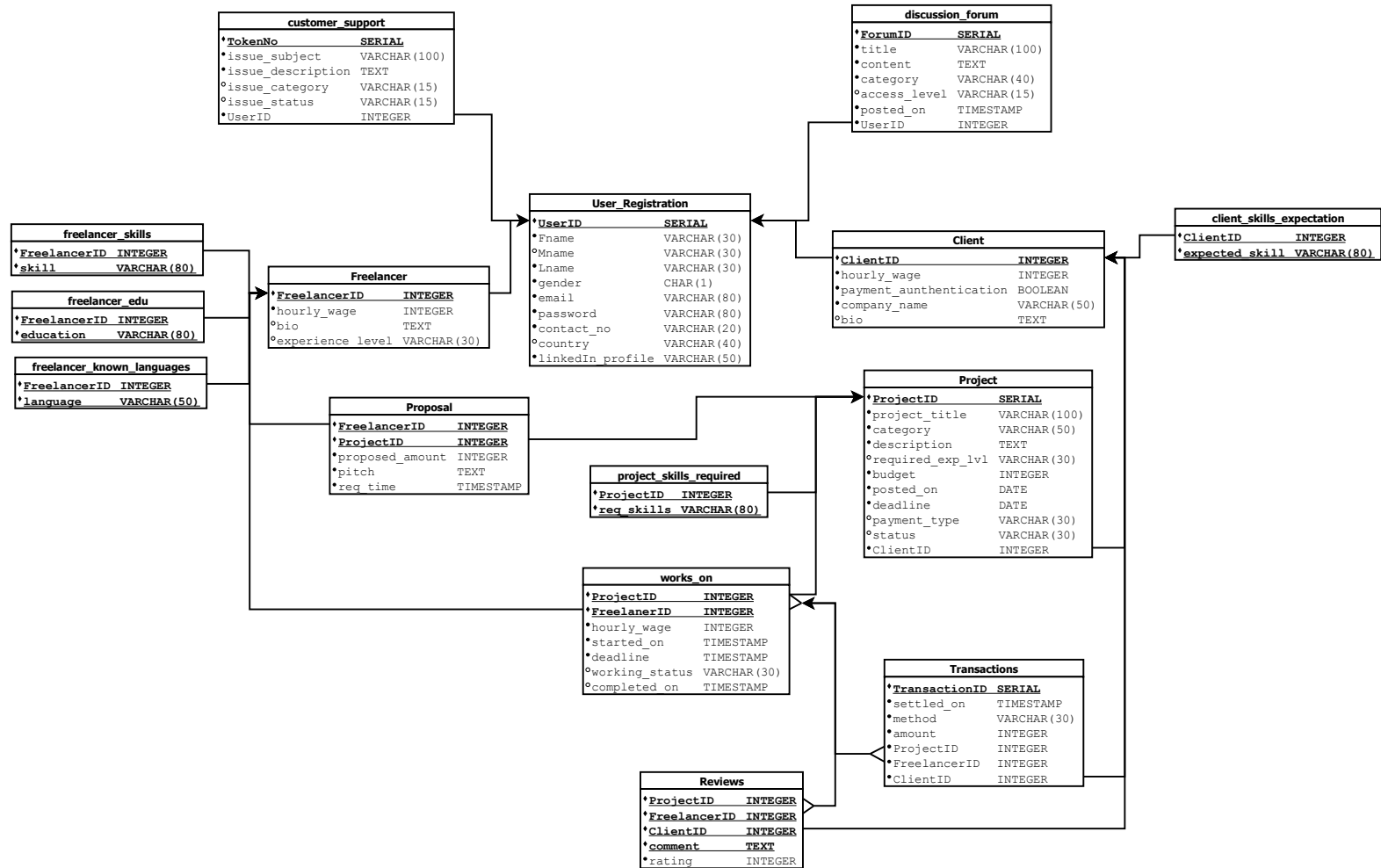
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## ❖ MINIMAL FD SET OF THE RELATION

**UserID  $\rightarrow$  Fname**

**UserID  $\rightarrow$  Mname**

**UserID  $\rightarrow$  Lname**

**UserID  $\rightarrow$  Gender**

**UserID  $\rightarrow$  Email**

**UserID  $\rightarrow$  Password**

**UserID  $\rightarrow$  Contact\_No**

**UserID  $\rightarrow$  Country**

**UserID  $\rightarrow$  linkedin\_profile**

**Email  $\rightarrow$  UserID**

**Contact\_No  $\rightarrow$  UserID**

**linkedin\_profile  $\rightarrow$  UserID**

**FreelancerID  $\rightarrow$  Bio**

**FreelancerID  $\rightarrow$  hourly\_wage**

**FreelancerID  $\rightarrow$  experience\_level**

**ClientID  $\rightarrow$  hourly\_wage**

**ClientID  $\rightarrow$  payment\_authentication**

**ClientID  $\rightarrow$  company\_name**

**ClientID  $\rightarrow$  Bio**

**ProjectID  $\rightarrow$  project\_title**

**ProjectID  $\rightarrow$  category**

**ProjectID  $\rightarrow$  description**

**ProjectID  $\rightarrow$  required\_exp\_level**

**ProjectID → budget**

**ProjectID → posted\_on**

**ProjectID → deadline**

**ProjectID → payment\_type**

**ProjectID → status**

**ProjectID → ClientID**

**{ProjectID, FreelancerID} → proposed\_amount**

**{ProjectID, FreelancerID} → pitch**

**{ProjectID, FreelancerID} → req\_time**

**{ProjectID, FreelancerID} → hourly\_wage**

**{ProjectID, FreelancerID} → started\_on**

**{ProjectID, FreelancerID} → deadline**

**{ProjectID, FreelancerID} → working\_status**

**{ProjectID, FreelancerID} → completed\_on**

**TranscationID → settled\_on**

**TranscationID → method**

**TranscationID → amount**

**TranscationID → ProjectID**

**TranscationID → FreelancerID**

**TranscationID → ClientID**

**{ClientID, FreelancerID, ProjectID, comment} → rating**

**TokenNo → issue\_subject**

**TokenNo → issue\_description**

**TokenNo → issue\_category**

**TokenNo → issue\_status**

**TokenNo → UserID**

**ForumNo → title**

**ForumNo → content**

**ForumNo → category**

**ForumNo → access\_level**

**ForumNo → posted\_on**

**ForumNo → UserID**

## ❖ **Proof that relations are in BCNF:**

### **1. 'User\_Registration' relation:**

**Attributes** (UserID, Fname, Mname, Lname, gender, email, password, contact\_no, country, linkedin\_profile)

#### **Functional Dependencies:**

UserID  $\rightarrow$  Fname  
UserID  $\rightarrow$  Mname  
UserID  $\rightarrow$  Lname  
UserID  $\rightarrow$  Gender  
UserID  $\rightarrow$  Email  
UserID  $\rightarrow$  Password  
UserID  $\rightarrow$  Contact\_No  
UserID  $\rightarrow$  Country  
UserID  $\rightarrow$  linkedin\_profile  
Email  $\rightarrow$  UserID  
Contact\_No  $\rightarrow$  UserID  
linkedin\_profile  $\rightarrow$  UserID

**Let X = UserID**

Clouse of X:

$X^+ = \{\text{UserID, Fname, Mname, Lname, gender, email, password, contact\_no, country, linkedin\_profile}\}$

**Let Y = email**

Clouse of Y:

$Y^+ = \{\text{UserID, Fname, Mname, Lname, gender, email, password, contact\_no, country, linkedin\_profile}\}$

**Let Z = linkedin\_profile**

Clouse of Z:

$Z^+ = \{\text{UserID, Fname, Mname, Lname, gender, email, password, contact\_no, country, linkedin\_profile}\}$

Let **W = contact\_no**

Clouse of W:

$W^+ = \{\text{UserID, Fname, Mname, Lname, gender, email, password, contact\_no, country, linkedin\_profile}\}$

Hence, **UserID, email, linkedin\_profile, contact\_no** are candidate keys of the relation.

The left side of FDs in the minimal FD set for the relation '**User\_Registration**' is either **UserID, email, linkedin\_profile or contact\_no**, which are the candidate keys of this relation. Hence, relation '**User\_Registration**' is in BCNF.

## 2. 'Freelancer' relation

**Attributes** (FreelancerID, hourly\_wage, bio, experience\_level)

**Functional Dependencies:**

FreelancerID  $\rightarrow$  Bio

FreelancerID  $\rightarrow$  hourly\_wage

FreelancerID  $\rightarrow$  experience\_level

Let **X = FreelancerID**

Clouse of X:

$X^+ = \{\text{FreelancerID, hourly\_wage, bio, experience\_level}\}$

Since closure of **FreelancerID** has all the attributes of '**Freelancer**' relation, **FreelancerID** is the candidate key of this relation.

The left side of all the minimal FDs of the relation '**Freelancer**' is **FreelancerID**, which is the key of this relation, so '**Freelancer**' is in BCNF.

## 3. 'freelancer\_skills' relation

**Attributes** (FreelancerID, skills)



Here, **Candidate Key** = {FreelancerID,skills}

In this relation, all attributes create a candidate key.  
According to the theorem, such relations are always in BCNF.

So, '**freelancer\_skills**' is in BCNF.

#### 4. '**freelancer\_edu**' relation

**Attributes** (FreelancerID, education)

Here, **Candidate Key** = {FreelancerID, education}

All attributes are a part of the candidate key.  
So, '**freelancer\_edu**' is in BCNF.

#### 5. '**freelancer\_known\_languages**' relation

**Attributes** (FreelancerID, language)

Here, **Candidate Key** = {FreelancerID, language}

According to the theorem, if all the attributes of a relation make a candidate key,  
then the relation is always in BCNF.

So, '**freelancer\_known\_languages**' is in BCNF.

#### 6. '**Client**' relation

**Attributes**(ClientID, hourly\_wage, payment\_authentication, company\_name, bio)

**Functional Dependencies:**

ClientID  $\rightarrow$  hourly\_wage

ClientID  $\rightarrow$  payment\_authentication

ClientID  $\rightarrow$  company\_name

ClientID  $\rightarrow$  Bio

Let **X = ClientID**

Clouse of X:

$X^+ = \{\text{ClientID}, \text{hourly\_wage}, \text{payment\_authentication}, \text{company\_name}, \text{bio}\}$

**ClientID** is the candidate key of a minimal FD set.

The left side of all the minimal FDs in the relation '**Client**' is **ClientID**, which is the key of this relation, so '**Client**' is in BCNF.

## 7. 'client\_skills\_expectation' relation

**Attributes**(ClientID,expected\_skills)

Here **Candidate Key** = {ClientID,expected\_skills}

According to the theorem, if all the attributes of a relation make a candidate key, then the relation is always in BCNF.

So, '**client\_skills\_expectation**' is in BCNF.

## 8. 'Project' relation

**Attributes** (ProjectID, project\_title, category, description, required\_exp\_lvl, budget, posted\_on, deadline, payment\_type, status, ClientID)

**Functional Dependencies:**

ProjectID  $\rightarrow$  project\_title

ProjectID  $\rightarrow$  category

ProjectID  $\rightarrow$  description

ProjectID  $\rightarrow$  required\_exp\_level

ProjectID  $\rightarrow$  budget

ProjectID  $\rightarrow$  posted\_on

ProjectID  $\rightarrow$  deadline

ProjectID  $\rightarrow$  payment\_type

ProjectID  $\rightarrow$  status  
ProjectID  $\rightarrow$  ClientID

Let **X = ProjectID**

Clouse of X:

$X^+ = \{\text{ProjectID}, \text{project\_title}, \text{category}, \text{description}, \text{required\_exp\_lvl}, \text{budget}, \text{posted\_on}, \text{deadline}, \text{payment\_type}, \text{status}, \text{ClientID}\}$

Since closure of **ProjectID** has all the attributes of '**Project**' relation, **ProjectID** is the candidate key.

The left side of all the minimal FDs in the relation '**Project**' is **ProjectID** , which is the key of this relation, so '**Project**' is in BCNF.

## 9. 'project\_skills\_required' relation

**Attributes**(ProjectID,required\_skills)

Here **Candidate Key** = {ProjectID,required\_skills}\

All attributes are a part of the candidate key.

So, '**project\_skills\_required**' is in BCNF.

## 10. 'Proposal' relation

**Attributes** (FreelancerID, ProjectID, proposed\_amount, pitch, req\_time)

**Functional Dependencies:**

{ProjectID, FreelancerID}  $\rightarrow$  proposed\_amount

{ProjectID, FreelancerID}  $\rightarrow$  pitch

{ProjectID, FreelancerID}  $\rightarrow$  req\_time

Let **X = {ProjectID, FreelancerID}**

Clouse of X:

$X^+ = \{\text{FreelancerID}, \text{ProjectID}, \text{proposed\_amount}, \text{pitch}, \text{req\_time}\}$   
**{ProjectID, FreelancerID}** is the candidate key of a minimal FD set.

The left side of all the FDs in the minimal set of FDs for the relation '**Proposal**' is **{ProjectID, FreelancerID}**, which is the key of this relation, so '**Proposal**' is in BCNF.

## 11. 'works\_on' relation

**Attributes** (ProjectID, FreelancerID, hourly\_wage, started\_on, deadline, working\_status, completed\_on)

**Functional Dependencies:**

$\{\text{ProjectID}, \text{FreelancerID}\} \rightarrow \text{hourly\_wage}$   
 $\{\text{ProjectID}, \text{FreelancerID}\} \rightarrow \text{started\_on}$   
 $\{\text{ProjectID}, \text{FreelancerID}\} \rightarrow \text{deadline}$   
 $\{\text{ProjectID}, \text{FreelancerID}\} \rightarrow \text{working\_status}$   
 $\{\text{ProjectID}, \text{FreelancerID}\} \rightarrow \text{completed\_on}$

Let **X = {ProjectID, FreelancerID}**

Clouse of X:

$X^+ = \{\text{ProjectID}, \text{FreelancerID}, \text{hourly\_wage}, \text{started\_on}, \text{deadline}, \text{Working\_status}, \text{completed\_on}\}$

**{ProjectID, FreelancerID}** is the candidate key of a minimal FD set.

The left side of all the minimal FDs of the relation '**works\_on**' is **{ProjectID, FreelancerID}**, which is the key of this relation, so '**works\_on**' is in BCNF.

## 12. 'Transactions' relation

**Attributes** (TransactionID, settled\_on, method, amount, ProjectID, FreelancerID, ClientID)

**Functional Dependencies:**

$\text{TransactionID} \rightarrow \text{settled\_on}$

$\text{TranscationID} \rightarrow \text{method}$   
 $\text{TranscationID} \rightarrow \text{amount}$   
 $\text{TranscationID} \rightarrow \text{ProjectID}$   
 $\text{TranscationID} \rightarrow \text{FreelancerID}$   
 $\text{TranscationID} \rightarrow \text{ClientID}$   
 $\{\text{ProjectID}, \text{FreelancerID}, \text{ClientID}\} \rightarrow \text{TransactionID}$

Let **X = {TranscationID}**

Clouse of X:

$X^+ = \{\text{TransactionID}, \text{settled\_on}, \text{method}, \text{amount}, \text{ProjectID}, \text{FreelancerID}, \text{ClientID}\}$

Let **Y = {ProjectID, FreelancerID, ClientID}**

Clouse of Y:

$Y^+ = \{\text{TransactionID}, \text{settled\_on}, \text{method}, \text{amount}, \text{ProjectID}, \text{FreelancerID}, \text{ClientID}\}$

Thus, **TranscationID, {ProjectID, FreelancerID, ClientID}** is the candidate key of a minimal FD set.

The left side of all the minimal FDs of the relation '**Transactions**' is candidate key, so '**Transactions**' is in BCNF.

## 13. 'Reviews' relation

**Attributes** (ProjectID, FreelancerID, ClientID, comment, rating)

**Functional Dependencies:**

$\{\text{ClientID}, \text{FreelancerID}, \text{ProjectID}, \text{comment}\} \rightarrow \text{rating}$

Let **X = {ClientID, FreelancerID, ProjectID, comment}**

Clouse of X:

$X^+ = \{\text{ProjectID}, \text{FreelancerID}, \text{ClientID}, \text{comment}, \text{rating}\}$

**{ClientID, FreelancerID, ProjectID, comment}** is the candidate key of a minimal FD set.

The left side of all the minimal FDs of the relation '**Reviews**' is {**ClientID, FreelancerID, ProjectID, comment**} which is the key of this relation, so '**Reviews**' is in BCNF.

## 14. 'customer\_support' relation

**Attributes** (TokenNo, issue\_subject, issue\_description, issue\_category, issue\_status, UserID)

### Functional Dependencies:

TokenNo  $\rightarrow$  issue\_subject

TokenNo  $\rightarrow$  issue\_description

TokenNo  $\rightarrow$  issue\_category

TokenNo  $\rightarrow$  issue\_status

TokenNo  $\rightarrow$  UserID

Let **X = TokenNo**

Closure of X:

$X^+ = \{\text{TokenNo, issue\_subject, issue\_description, issue\_category, issue\_status, UserID}\}$

Since closure of **TokenNo** has all the attributes of '**customer\_support**' relation, **TokenNo** is the candidate key.

The left side of all the minimal FDs of the relation '**customer\_support**' is **TokenNo**, which is the key of this relation, so '**customer\_support**' is in BCNF.

## 15. 'discussion\_forum' relation

**Attributes**(ForumID, title, content, category, access\_level, posted\_on, UserID)

### Functional Dependencies:

ForumNo  $\rightarrow$  title

ForumNo  $\rightarrow$  content

ForumNo  $\rightarrow$  category

ForumNo  $\rightarrow$  access\_level

ForumNo  $\rightarrow$  posted\_on

$\text{ForumNo} \rightarrow \text{UserID}$

Let **X = ForumID**

Clouse of X:

$X^+ = \{\text{ForumID}, \text{title}, \text{content}, \text{category}, \text{access\_level}, \text{posted\_on}, \text{UserID}\}$

Since closure of **ForumID** has all the attributes of '**discussion\_forum**' relation, **ForumID** is the candidate key.

The left side of all the minimal FDs of the relation '**discussion\_forum**' is **ForumID**, which is the key of this relation, so '**discussion\_forum**' is in BCNF.