DBMS – T404

Group Information:

GroupID – 4

202301204 – Ayush Dhamecha

202301249 – Jenil Shah

202301250 – Vivek Dodiya

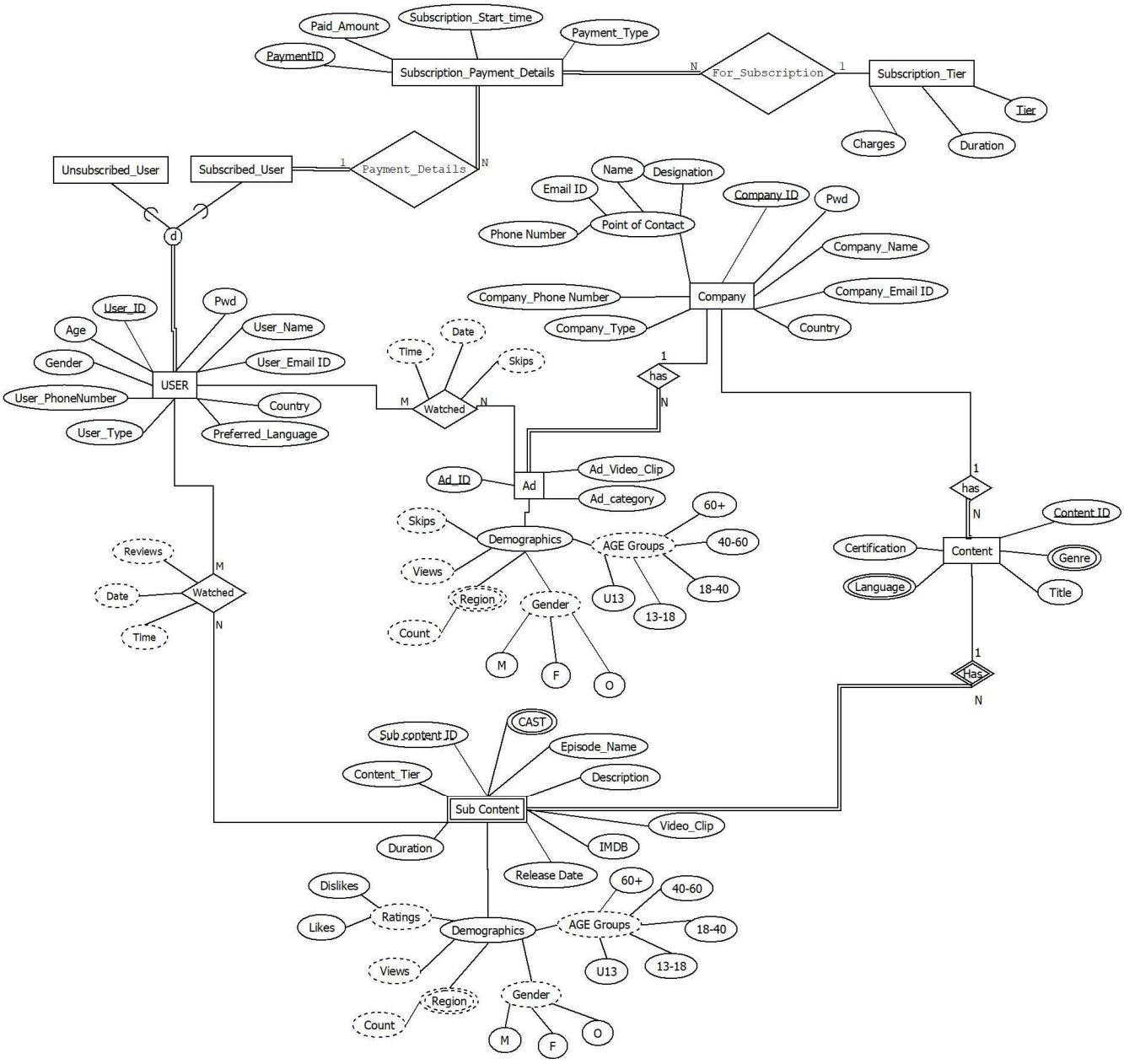
202301223 – Rudra Raiyani

Database Name: **“CosmoFlix11 – An online streaming platform”**

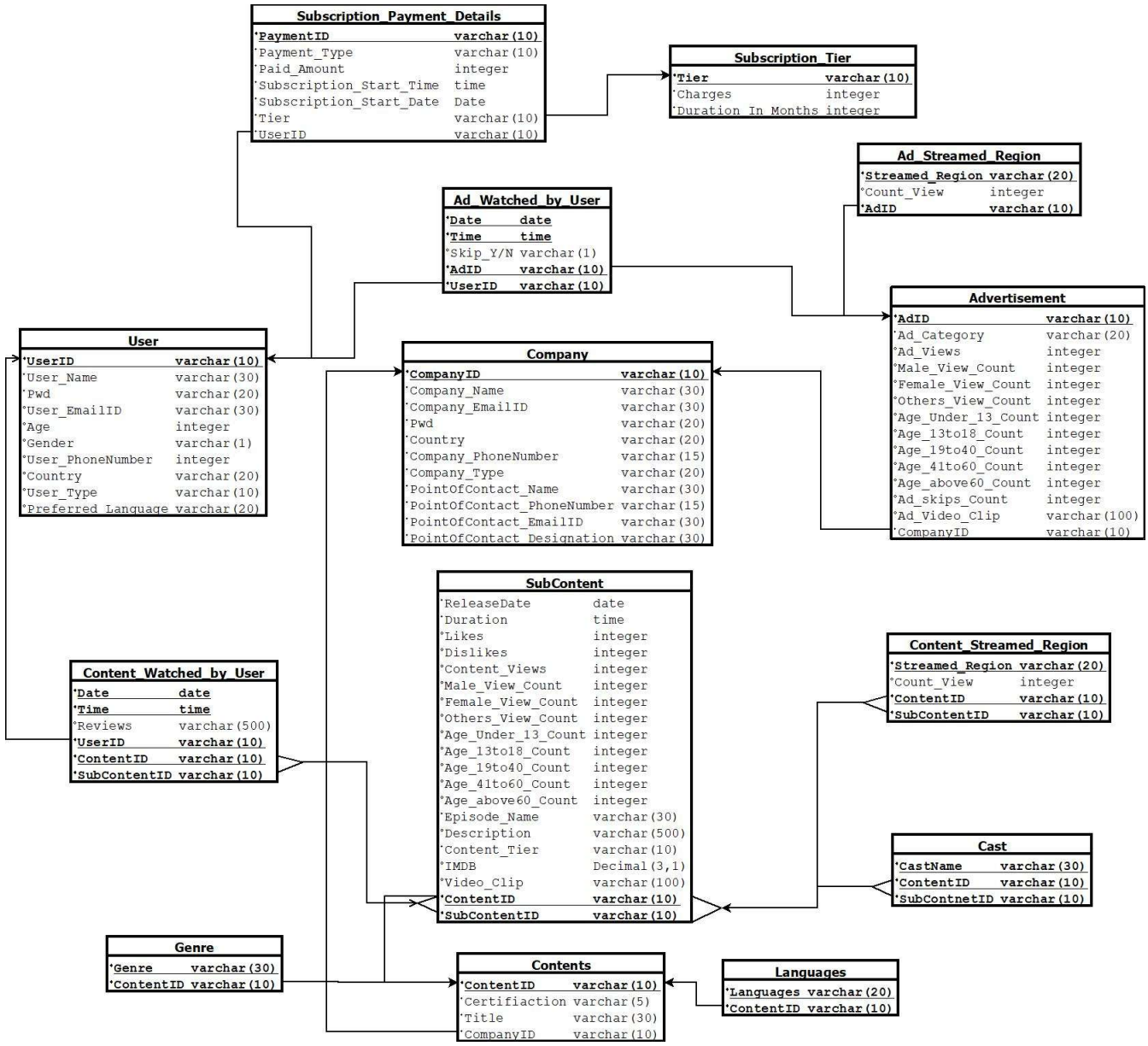
Deliverables:

- Updated ER-Diagram
- Relational Schema
- Minimal FD sets
- BCNF verification

- Updated ER-Diagram:



- Relational-Schema:



- **Minimal FD set & BCNF verification of all the relations: -**

→ **User** relation:

UserID → User_Name

UserID → Pwd

UserID → User_EmailID

UserID → Age

UserID → Gender

UserID → User_PhoneNumber

UserID → Country

UserID → User_Type

UserID → Preferred_Language

User_EmailID → UserID

→ BCNF verification:

- Here, if we find the key of the relation, then we will get to know that UserID and User_EmailID both uniquely determines all other attributes of this relation. We can write it like below:

UserID$^+$ = {UserID, User_Name, Pwd, User_EmailID, Age, Gender,

User_PhoneNumber, Country, User_Type, Preferred_Language}

User_EmailID$^+$ = {UserID, User_Name, Pwd, User_EmailID, Age, Gender,

User_PhoneNumber, Country, User_Type, Preferred_Language}

- Here, both are keys individually and all other attributes are solely dependent on only these two individually, therefore we can consider any one of these as our key of the relation. For convenience, we can take **UserID as key** of this relation. Thus, for all X → Y in this relation, X is superkey/key.

- So, on the left side we only have superkey/key of minimal set and therefore, this relation is in BCNF.

→ **Company** relation:

CompnyID → Company_Name

CompnyID → Company_EmailID

CompnyID → Pwd

CompnyID → Country

CompnyID → Company_Type

CompnyID → Company_PhoneNumber

CompnyID → PointOfContact_Name

CompnyID → PointOfContact_EmailID

CompnyID → PointOfContact_PhoneNumber

CompnyID → PointOfContact_Designation

Company_EmailID → CompanyID

Company_PhoneNumber → CompanyID

→ BCNF verification:

- Here, in this relation we have three attributes that determines all the other attributes of this relation, and those are CompanyID, Company_EmailId and Company_PhoneNumber. If we find closure of attributes of these three then we will get the below results:

CompanyID$^+$ = {CompanyID, Company_Name, Company_EmailID, Pwd, Country,

Company_Type, Company_PhoneNumber, PointOfContact_Name,

PointOfContact_EmailID, PointOfContact_PhoneNumber,

PointOfContact_Designatiion}

Company_EmailID$^+$ = {Same as above}

Company_PhoneNumber$^+$ = {Same as above}

- Here, all three are keys individually and all other attributes are solely dependent on only these three individually, therefore we can consider any one of these as our key of the relation. For convenience, we can take **CompanyID as key** of this relation. Thus, for all X → Y in this relation, X is superkey/key.

- So, on the left side we only have superkey/key of minimal set and therefore, this relation is in BCNF.

→ **Content** relation:

ContentID → Certification

ContentID → Title

ContentID → CompanyID

→ BCNF verification:

- In this relation, we have ContentID as key that determines all the other attributes, below is the closure of ContentID.

ContentID$^+$ = {Certification, Title, CompanyID}

- So, for all X → Y in this relation, X is superkey/key (**ContentID is key**) in this relation and thus this relation is in BCNF.

→ **Language** relation:

{Languages, ContentID} → Languages

{Languages, ContentID} → ContentID

(Apparently, minimal set should be Null if we don't consider trivial FD here.)

→ BCNF verification:

- In this relation, we have only these FDs and both are trivial FDs and thus the minimal FD set comprises only 'Null' as an element. If we talk about key of the relation then it will only be **{Languages, ContentID}**. Closure is given below:

{Languages,ContentID}$^+$={Languages, ContentID}

→ **Content_Watched_by_User** relation:

{Date, Time, UserID, ContentID, SubContentID} → {Reviews}

→ BCNF verification:

- We can see that in this relation we have one non trivial FD only, because all these five attributes jointly determine the review that any user gave to particular subcontent. These are compatible to the relation only if they are unique compositely. Thus, because we have non trivial FD here with having relation's key as its determinant. Thus, this relation in is BCNF.

{Date, Time, UserID, ContentID, SubContentID}$^+$ → {Date, Time, UserID, ContentID, SubContentID, Reviews}

→ **SubContent** relation:

{SubContentID,ContentID} → ReleaseDate

{SubContentID,ContentID} → Duration

{SubContentID,ContentID} → Likes

{SubContentID,ContentID} → Dislikes

{SubContentID,ContentID} → Content_Views

{SubContentID,ContentID} → Male_View_Count

{SubContentID,ContentID} → Female_View_Count

{SubContentID,ContentID} → Others_View_Count

{SubContentID,ContentID} → Age_Under_13_Count

{SubContentID,ContentID} →Age_13to18_Count

{SubContentID,ContentID} → Age_19to40_Count

{SubContentID,ContentID} → Age_41to60_Count

{SubContentID,ContentID} → Age_above60_Count

{SubContentID,ContentID} → Episode_Name

{SubContentID,ContentID} → Description

{SubContentID,ContentID} → Content_Tier

{SubContentID,ContentID} → IMDB

{SubContentID,ContentID} → Video_Clip

→ BCNF verification:

- In this relation, because SubContent is weak entity, we need to consider **SubContentID and ContentID as composite key** which determines all other attributes and below is the closure of this:

{SubContentID, ContentID}$^{+}$ = {all the attributes of the above relation}

- Here BCNF property of having only superkey as a determinant for all the existing FDs is satisfying and above closure is the solely determinant of all the attributes of this relation. Thus, this relation is also in BCNF.

→ **Ad_Watched_by_User** relation:

{Date, Time, UserID, AdID} → {Skip_YN}

→ BCNF verification:

- We can see that in this relation again we have one non trivial FD and others are trivial FD, and the non trivial FD has the relation's key as its determinant. Thus, it satisfies the BCNF property and this relation is in BCNF.

{Date, Time, UserID, AdID}$^+$ → {Date, Time, UserID, AdID, Skip_YN}

→ **Advertisement** relation:

AdID → Ad_Category

AdID → Ad_Views

AdID → Male_View_Count

AdID → Female_View_Count

AdID → Others_View_Count

AdID → Age_Under_13_Count

AdID → Age_13to18_Count

AdID → Age_19to40_Count

AdID → Age_41to60_Count

AdID → Age_above60_Count

AdID → Ad_skips_Count

AdID → Ad_Video_Clip

AdID → CompanyID

→ BCNF verification:

- In this relation, AdID is the attribute that uniquely determines all other attributes and all the attributes of this relation is solely dependent on only AdID. Thus, **AdID will be the key** of this relation and closure of it will be as below:

AdID$^+$ = {all attributes of the above relation}

- Thus, key of the relation solely determines all other attributes and therefore this relation is in BCNF.

→ **Content_Streamed_Region** relation:

{Streamed_Region, ContentID, SubContentID} → Count_View

→ BCNF verification:

- In this relation, **Streaming region, ContentID and SubContentID compositely determines** the view counts of the particular content and above is the only possible non- trivial FD and below is the closure which is the key of this relation:

{Streamed_Region, ContentID, SubContentID}$^+$ = {Streamed_Region, ContentID, SubContentID, Count_View}

- Thus, there is trivial FD and non-trivial FD having relation's key as key are present here and therefore this relation is in BCNF.

→ **Ad_Streamed_Region** relation:

{Streamed_Region, AdID} → Count_View

→ BCNF verification:

- In this relation, as same as the previous relation Content_Streamed_Region, the three attributes **Streamed_Region, AdID and SubContentID is compositely determining** the fourth attribute Count_View. These composite attribute set is the key of the relation here and all other attributes are solely dependent on this key only. So below is the closure:

{Streamed_Region, AdID, SubContentID}$^+$ = {Streamed_Region, AdID, SubContentID, Count_View}

- Therefore, as same as the previous relation, this relation is also in BCNF.

→ **Cast** relation:

{CastName,ContentID,SubContentID} → CastName

(Apparently, minimal set should be Null if we don't consider trivial FD here.)

→ BCNF verification:

- In this relation, CastName can only be determined by ContentID, SubContentID and CastName itself because we cannot determine it solely. Therefore **ContentID, SubContentID and CastName compositely determines** CastName and there is only one FD which is trivial and thus it always satisfies BCNF property and therefore it is in BCNF.

{CastName, ContentID, SubContentID}$^+$ = {CastName, ContentID, SubContentID}

→ **Genre** relation:

{Genre, ContentID} → Genre

(Apparently, minimal set should be Null if we don't consider trivial FD here.)

→ BCNF verification:

- In this relation, we again have only trivial FD and **Genre and ContentID jointly determines** Genre itself and thus we can simply see that it is in BCNF. Below is the closure of the key:

{Genre, ContentID}$^+$ = {Genre, ContentID}

→ **Subscription_Payment_Details** relation:

PaymentID → Payment_Type

PaymentID → Paid_Amount

PaymentID → Subscription_Start_Time

PaymentID → Subscription_Start_Date

PaymentID → Tier

PaymentID → User_ID

→ BCNF verification:

- In this relation, we have **PaymentID as key** of the entire relation because all the attributes are solely dependent on PaymentID only and there is no other determinant that infers any attribute. Thus, below is the closure:

{PaymentID}$^+$ = {Payment_Type, Paid_Amount, Subscription_Start_Time, Subscription_Start_Date, Tier, User_ID}

- Therefore, this relation is in BCNF.

→ **Subscription_Tier** relation:

Tier → Charges

Tier → Duration_In_Months

→ BCNF verification:

- In this relation, we have unique and non-null attribute called **Tier as key** because it shows the different types of subscription facilities and that is unique inside the relation and therefore it solely determines all other attributes and every attribute of the relation is only and only dependent on Tier only. Thus, this relation is also in BCNF. **{Tier}**$^+$ = {Charges, Duration_In_Months}

- **Now, in all above relations, we saw that all these relations are in BCNF and therefore we can say that our entire database comprises the BCNF properties and thus, our database is in Boys Codd Normal Form with minimum possible redundancies.**

---- END ----