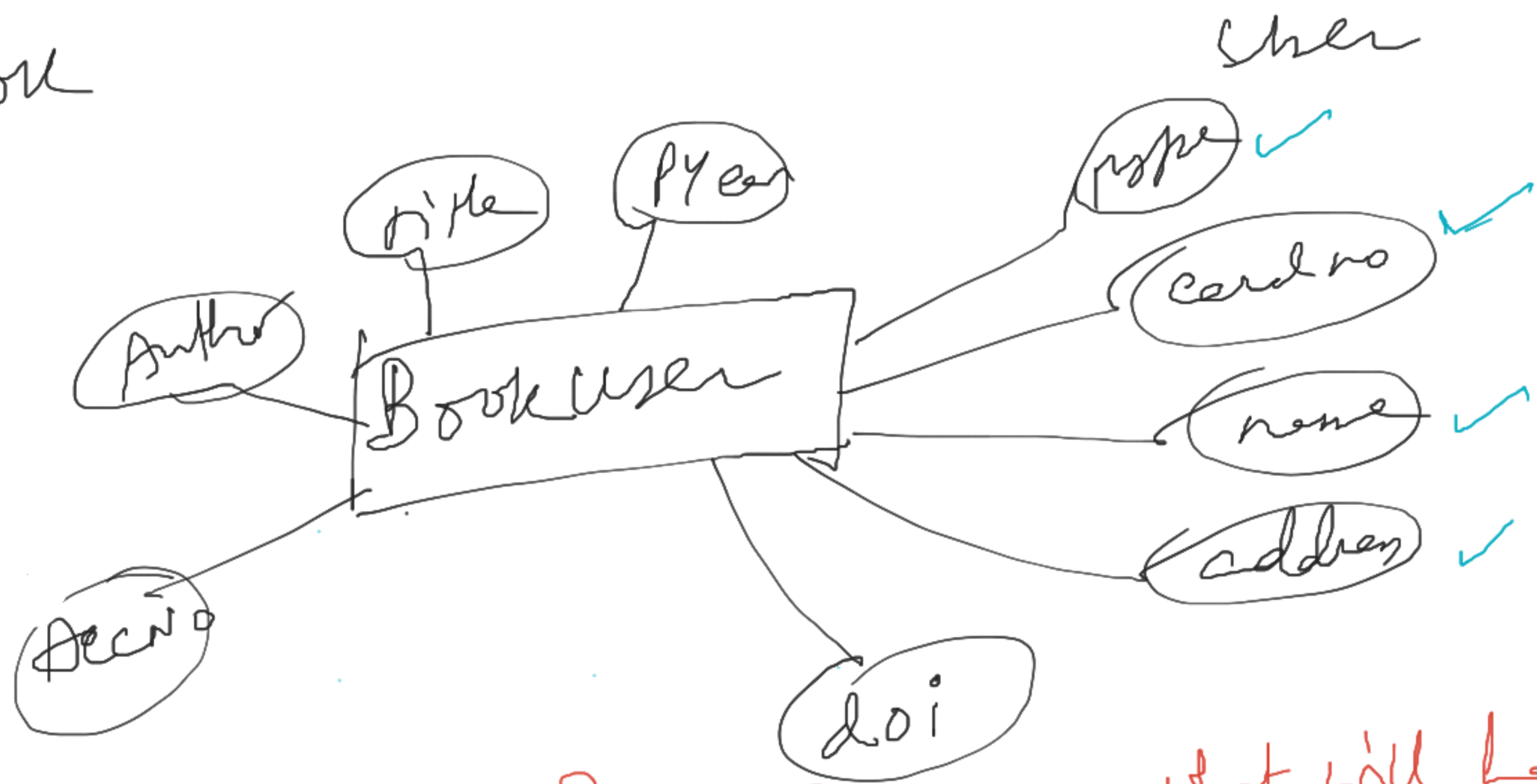


Book



if we merge Book & User, that will happen
if ~~no~~ some user does not issues a book, then corresponding
attribute values will be NULL

Phone



Every staff may not have phone
e.g. library phone





CARDINALITY

→ 1 staff has 1 phone
 → " " m phones
 → m " 1
 → m " m

1 staff has no phone or 1 phone max
 1 " has multiple phones

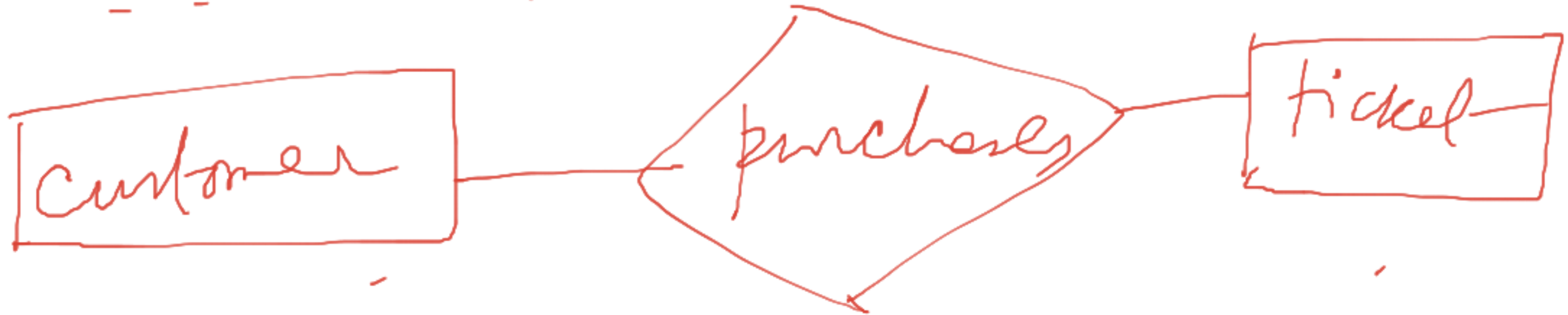
1	0..1
1	0..m or 0..*

Existence Dependency



Account is existence dependent on customer

ticket -



Key Attributes

Super Key (SK): A set of one or more attributes which taken collectively allows us to uniquely identify an entity in an entity set

Candidate Key (CK) is a super key for which no proper subset is also a super key.
[Minimal super key]

Primary key (PK) is a candidate key chosen by the conceptual designer as the chief attribute set by which an entity is identified in an entity set.

P.K. is any one of CK, but it should not be NULL.

$$S.K. = \{ \underline{A} \}, \{ \underline{AB} \}, \{ \underline{BCD} \}$$

$$C.K. = \{ \underline{A} \}$$

Existence dependency



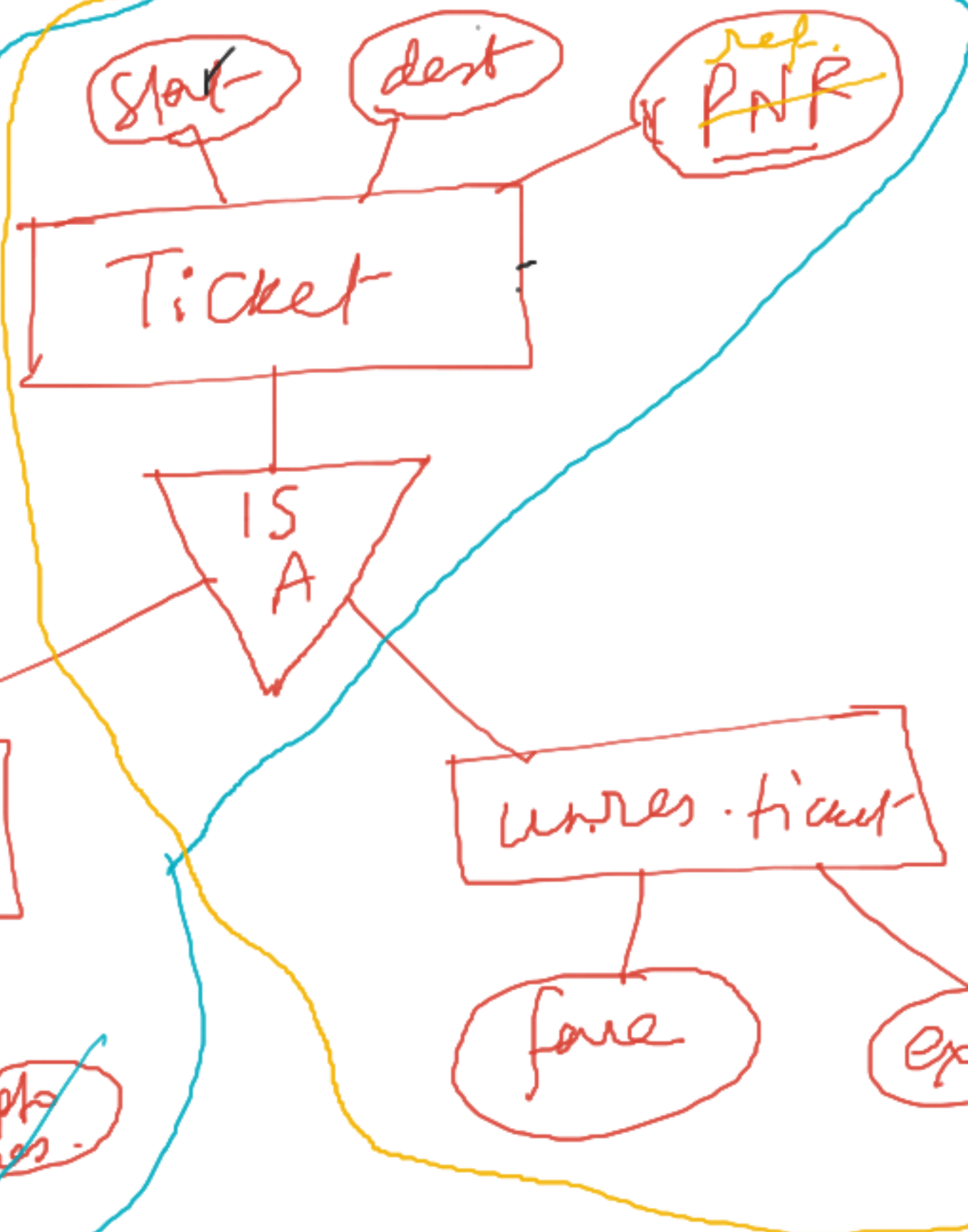
Account:

Weak entity is defined by a set of its own attributes, and (primary key) of the strong entity

C.K.

Generalizability

✓



Ticket

ref	start	dest

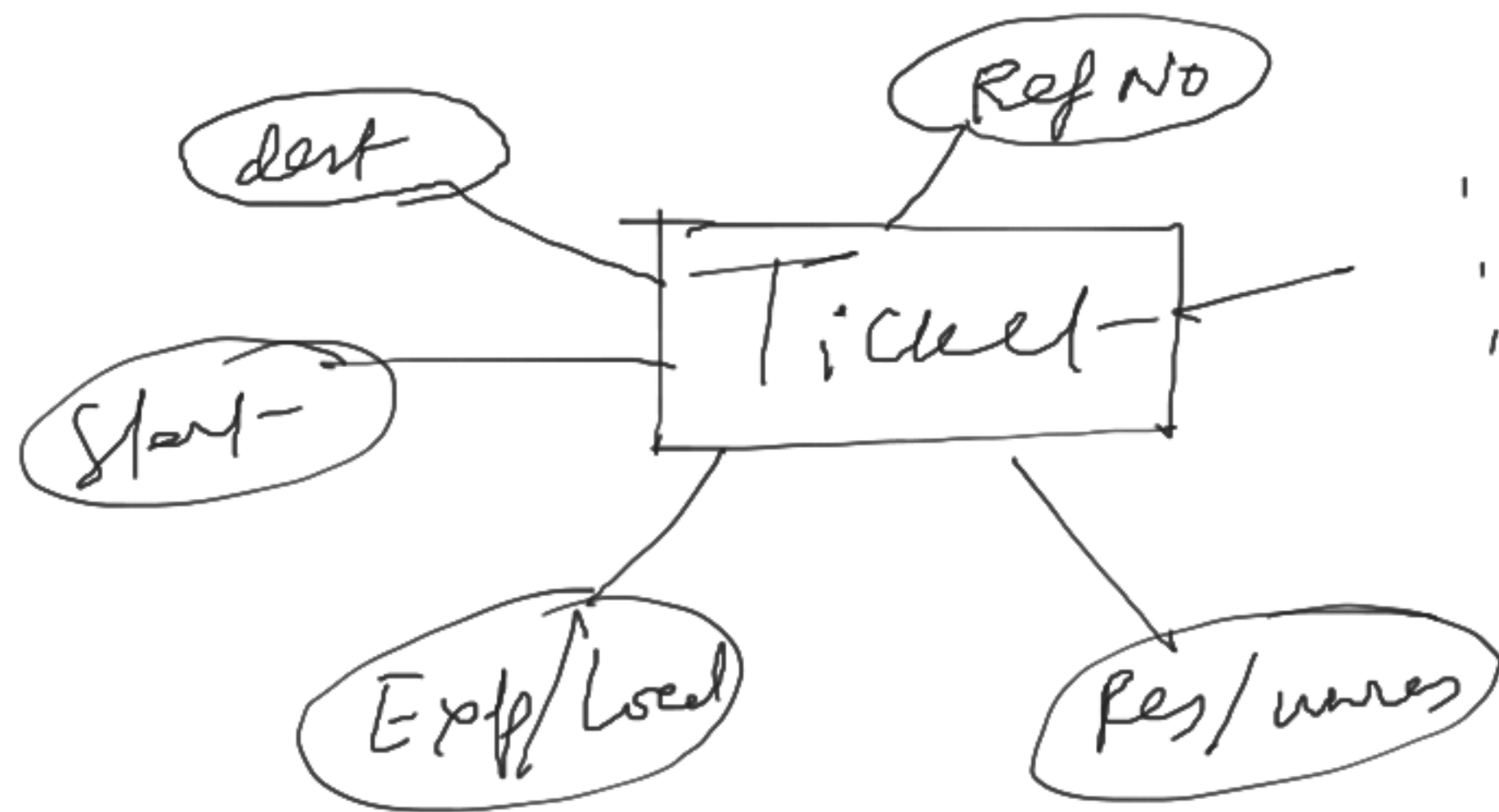
Res ticket

ref	f	S	T	D

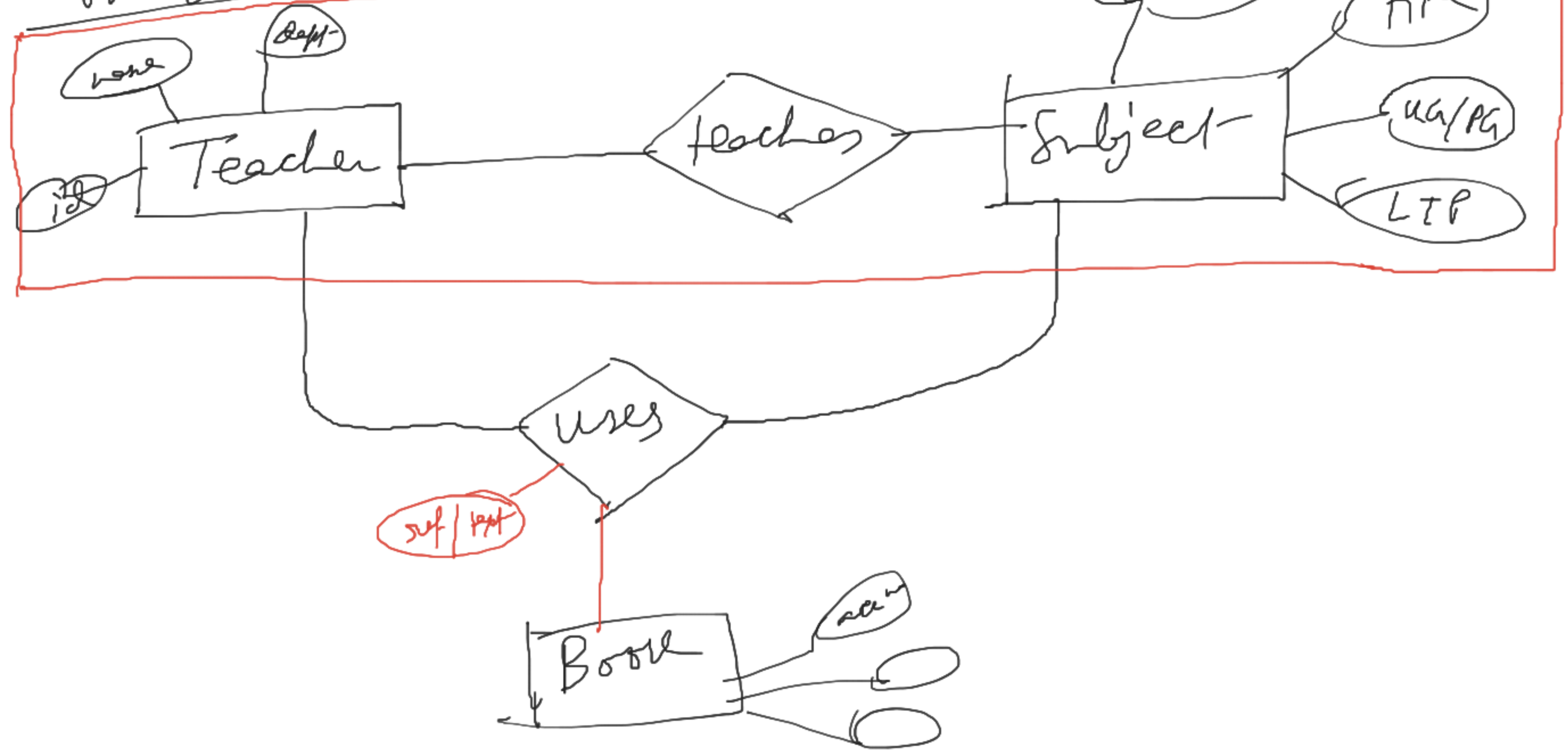
unres.

ref.	fare	type

?



Aggregation ←



Relational model

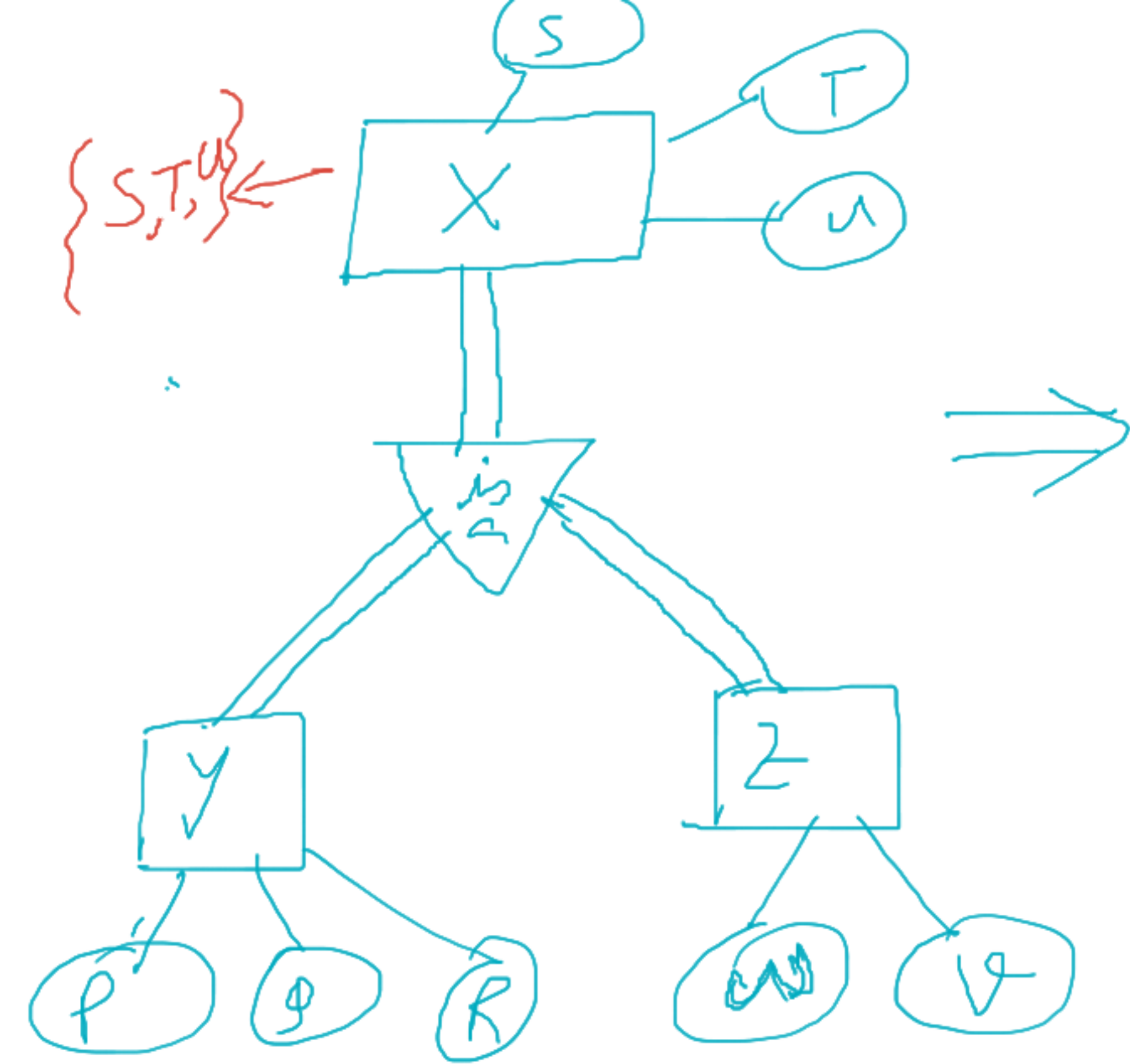
create tables



Book

B_By

User



E-R model

R1

S	T	U	P	Q	R

R2

S	T	U	W	V

Relational model

Database Scheme

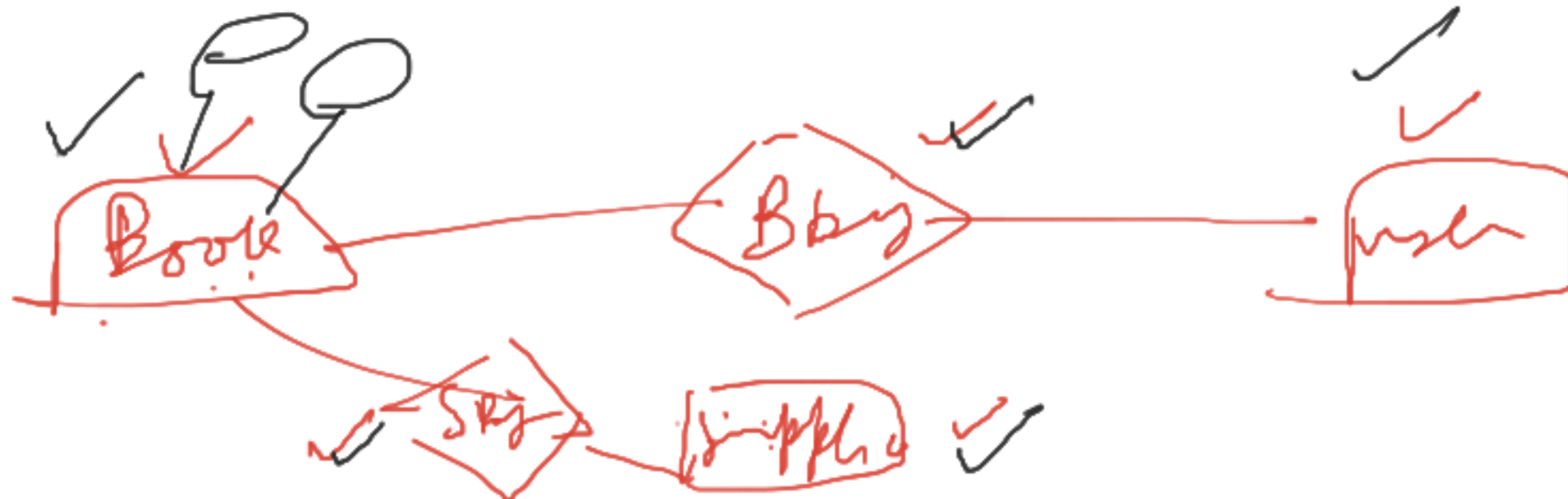
- 1) Book (Acc No, Year, Title)
- 2) User (Card No, Name, Address)
- 3) Supplier (Sup No, S add, S name)
- 4) BorrowBy (Acc No, Card no, date of issue)
- 5) SupplyBy (Acc No, Sup No, Price, Date of supply)

③

Sup No	S add	S name
S001	Lucen	XYZ
S002	P. the	ABC

⑤

Acc No	S No	Price	Pos
A001	S001	800	4/6/23
A002	S001	1000	5/2/24



H.W.

Roll	FName	LName	DOB	Passport	Aadhar	Dept
R001	Ram	Yadav	24/07/89	J123.	123.	CSE
R002	Xyz	ABC	26/04	<u>NULL</u>	86)	ECE
R003	Mitch	Zane	21/04	K12345	12392	CSE
R004	Rahim	MD	24/07/87	<u>NULL</u>	45651	EE

Key: S.K.: $\{\text{Roll}\}, \{\text{Aadhar}\}, \{\text{Roll, DOB}\}, \{\text{Aadhar, FName, ...}\}$

C.K.: $\{\text{Roll}\}, \{\text{Aadhar}\}$

P.K.: $\{\text{Roll}\}$ OR $\{\text{Aadhar}\}$

Secondary key or alternate key: $\{\text{Aadhar}\}$ or $\{\text{Roll}\}$

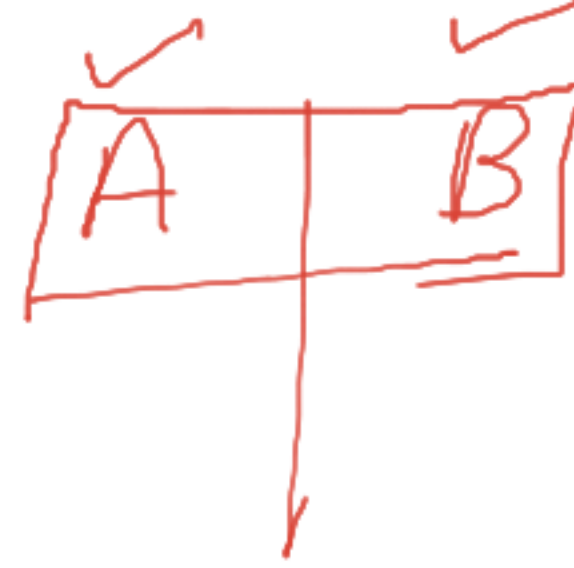
Surrogate key/ ~~Synthetic key~~ in a DB is a unique identifier for either an entity in the modelled world or an object in DB

Surr. key is not derived from application data

e.g., Sl. No.

Sl		FN	LN	DOB
A 1 2	1	Ram	Yadav	24/07/1989 ←
	2	Ram	Yadav	24/07/1989 ←
→ 10		—	—	— — — — — →

Roll	FName	LName	DOB	Passport	Address	Dept
R001	Ram	Yadav	24/07/89	J123	123	CSE
R002	Priya	ABC	26/04	NULL	86)	ECE
R003	Michael	Zane	21/04	K12345	12392	CSE
R004	Rahim	MD	24/07/87	NULL	45651	EE



Composite Key: {FName, LName}

- .) consists of more than 1 attribute to uniquely identify an entity occurrence
- ..) one or more attributes, which makes up the key, but are not simple keys in their own right

~~Roll, DOB~~

Roll: C.K.

Composite Key → { F-Name, LName, DOB, Dept }

Foreign Key (F.K.)

F.K. constraint: value in one relation should/ be in another must

Student

<u>Roll</u>	Name	DOB	Dept
:	:	:	:

Referenced ✓

Course

<u>Course#</u>	CName	Credit
:	:	:

Referenced ✓

Enrollment

<u>Roll</u>	<u>Course#</u>	Faculty ID
:	:	:

Referencing ✓

Referencing relation
Enrollment (F.K.: Roll, Course#)

Referenced rel:
Student, Course

Compound key: $\{\text{Roll}, \text{Course \#}\}$

Compound Key: $\{\text{Roll}, \text{Course \#}\}$

.) consists of more than 1 attribute to uniquely identify an entity occurrence

..) one or more attributes, which makes up the key, but are simple keys in their own right

E.R. model

Relational model

Relational Algebra: formal query language

we now earlier

Relational Model

1. Concept of relation

2. unifying idea combining entities and relationships

3. may be looked upon as a TABLE OF ELEMENTS where each TABLE is characterized by a SET OF ATTRIBUTES

$R = (A, B, C)$: is a set of attributes
 $\text{dom}(A), \text{dom}(B), \text{dom}(C)$

$\text{dom}(A) = \{1, 2, 3\}$

$\text{dom}(B) = \text{set of all strings of length} = 20$

$\text{dom}(C) = \{\text{'Ajay'}, \text{'Vijay'}\}$

domain is a set of values that a particular attribute can take

Relation

$$r \subseteq \text{dom}(A) \times \text{dom}(B)$$

↑
subset

A

1
2
3

B

1
2
3

C

Ajay
Vijay

example
 $r(A) \times r(B)$

A	B

All possible combinations

