

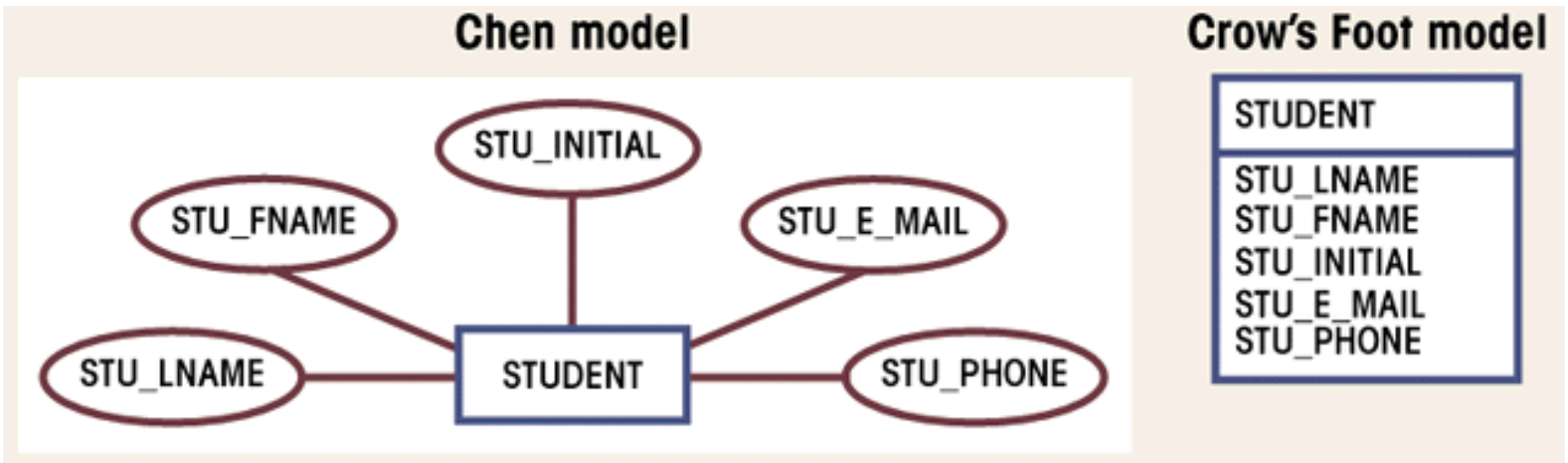
ENTITY-RELATIONSHIP DIAGRAM

EGCO321 DATABASE SYSTEMS

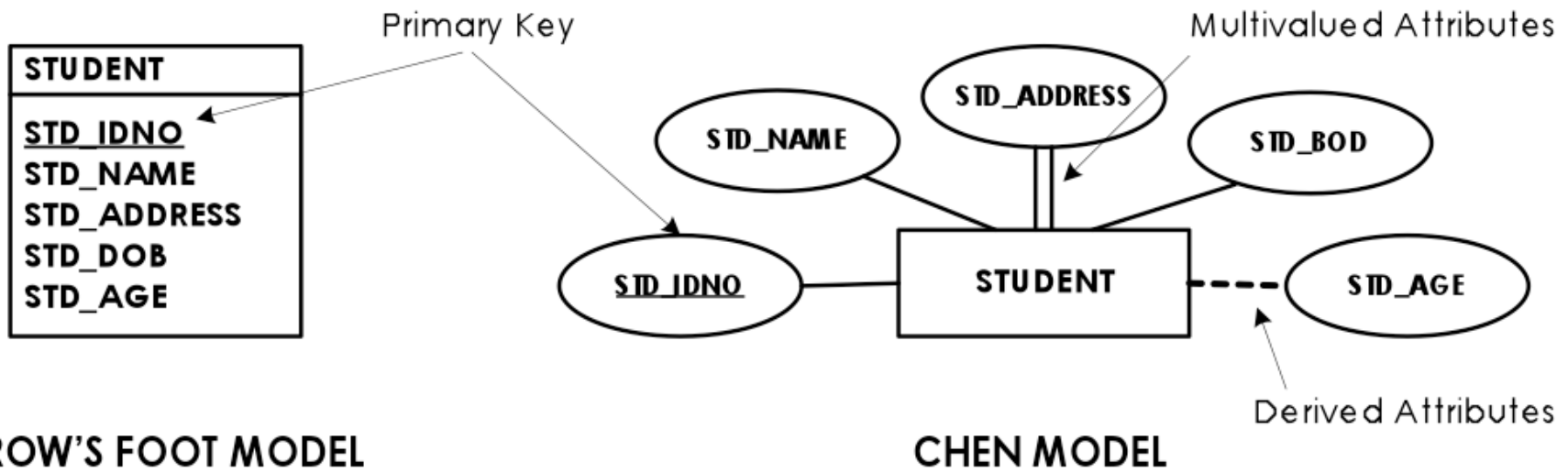


KANAT POOLSAWASD
DEPARTMENT OF COMPUTER ENGINEERING
MAHIDOL UNIVERSITY

ENTITY-RELATIONSHIP DIAGRAM



ATTRIBUTES



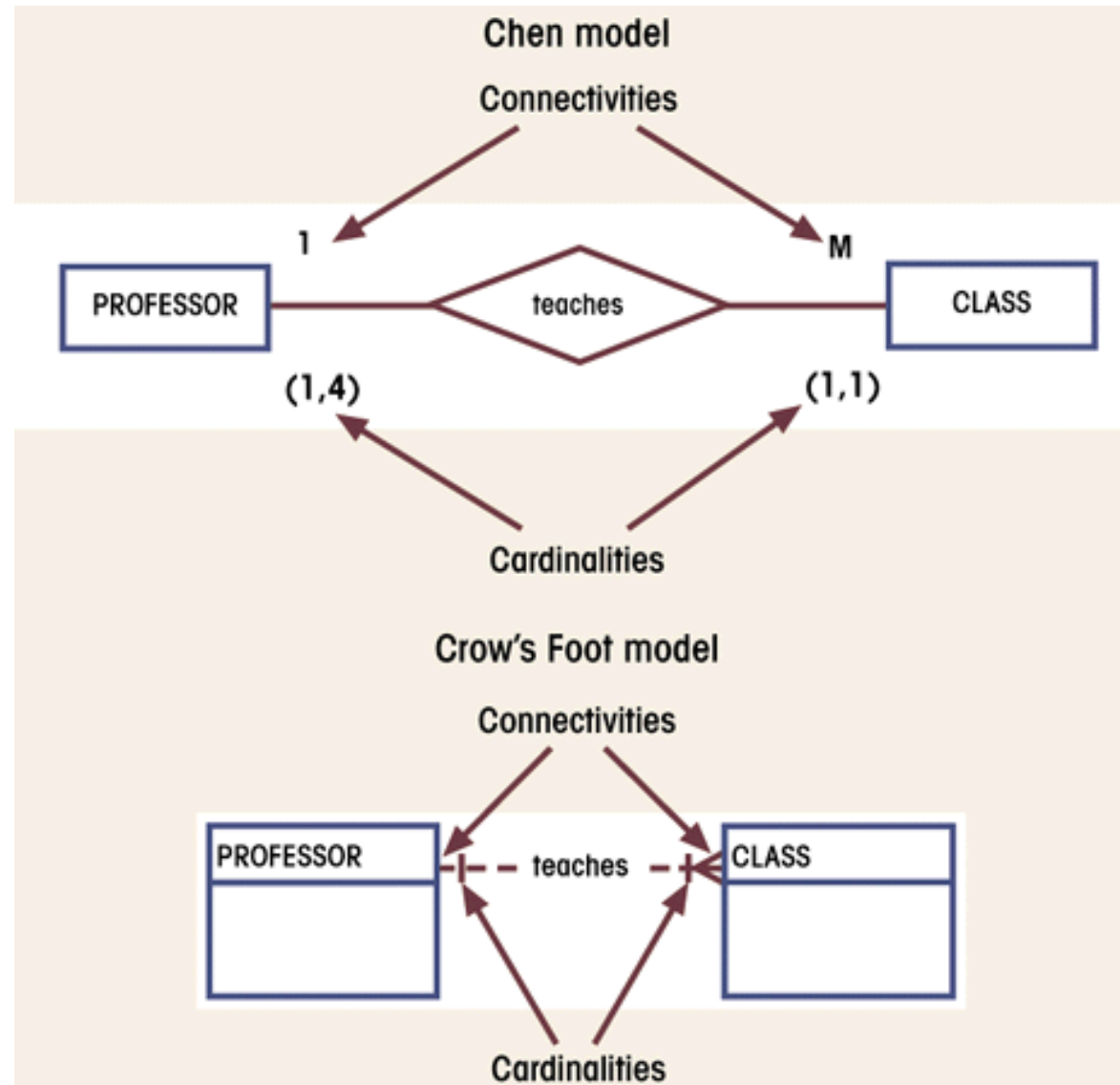
KEYS

- A key consists of one or more attributes that determine other attributes.
- **Primary Key (PK)** – minimal subset of fields that is unique identifier for a tuple.
- **Foreign Key (FK)** – connections between tables.

RELATIONSHIPS

- Association between entities
- Connected entities are called participants
- Operate in both directions
- Connectivity describes relationship classification
 - 1:1, 1:M, M:N
- Cardinality
 - Expresses number of entity occurrences associated with one occurrence of related entity

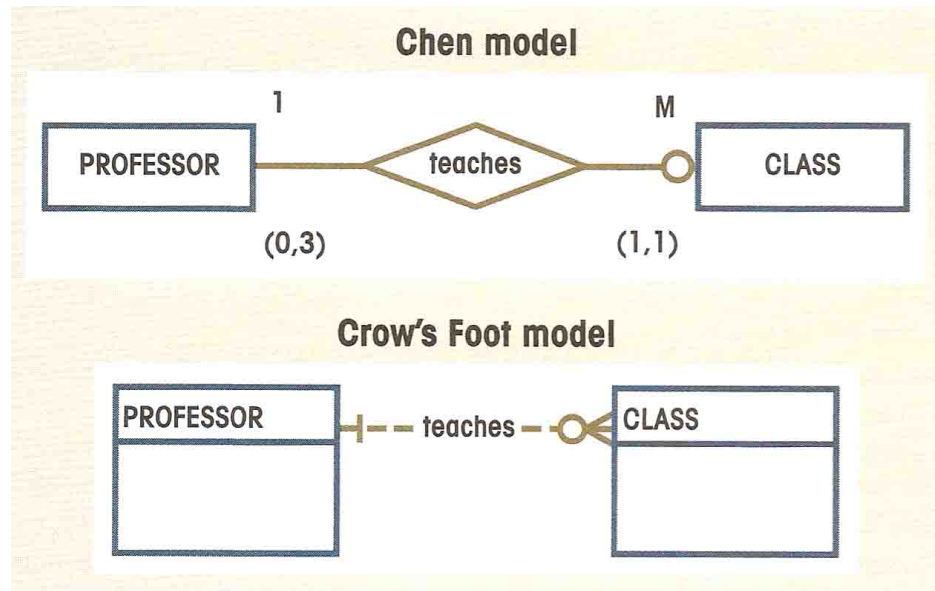
CONNECTIVITY & CARDINALITY



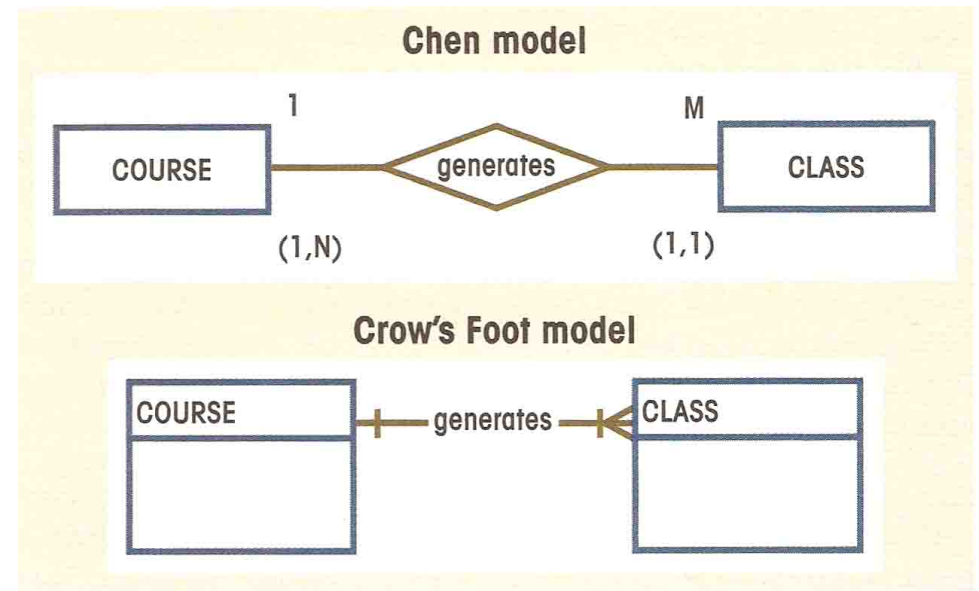
RELATIONSHIP PARTICIPATION (1)

- Optional
 - Entity occurrence does not require a corresponding occurrence in related entity
 - Shown by drawing a small circle on side of optional entity on ERD
- Mandatory
 - Entity occurrence requires corresponding occurrence in related entity
 - If no optionality symbol is shown on ERD, it is mandatory

RELATIONSHIP PARTICIPATION (2)

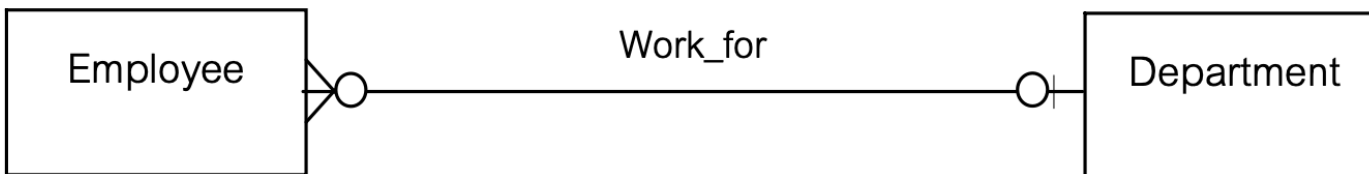
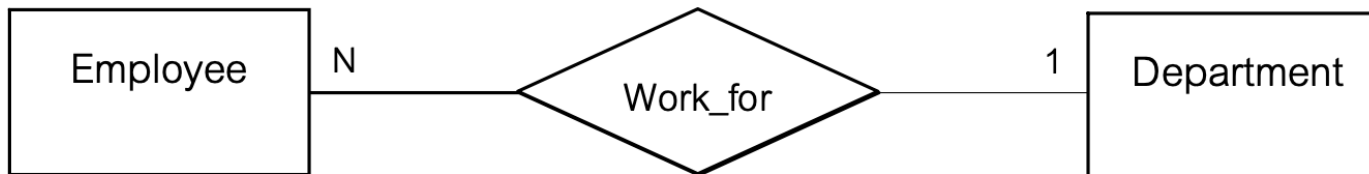
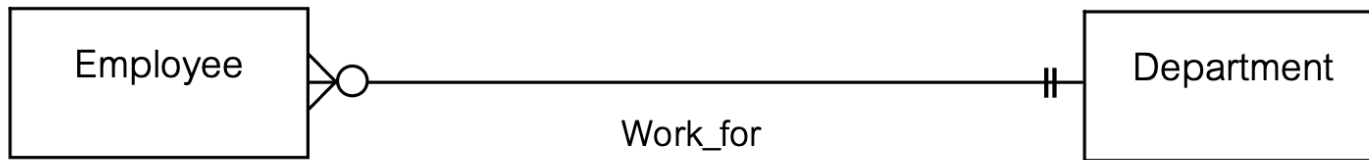
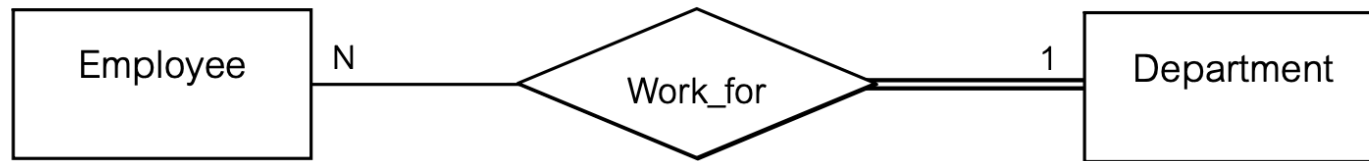


(a) An Optional Entity

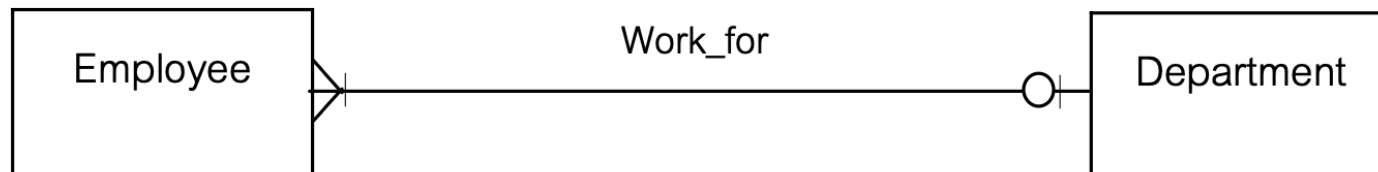
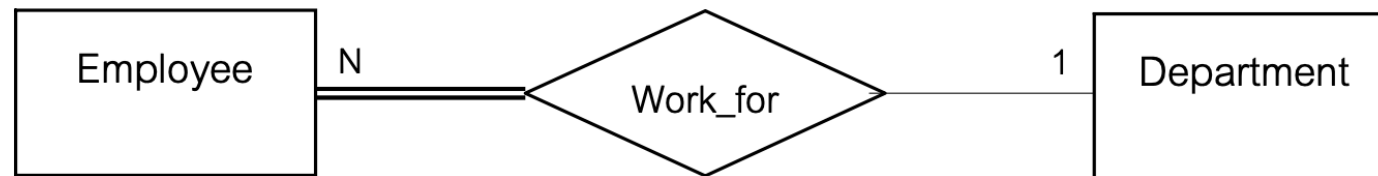
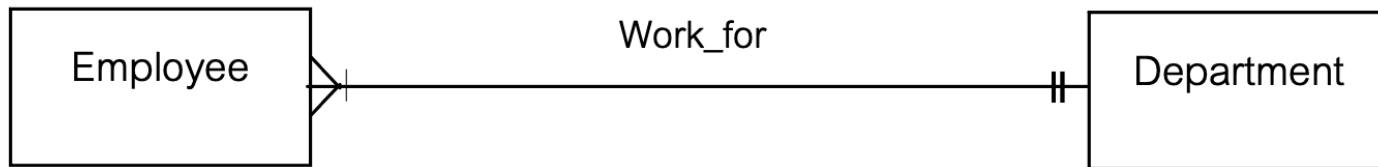
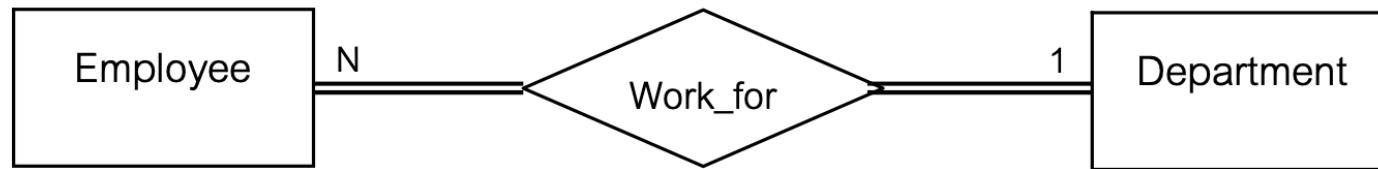


(b) Mandatory Relationship

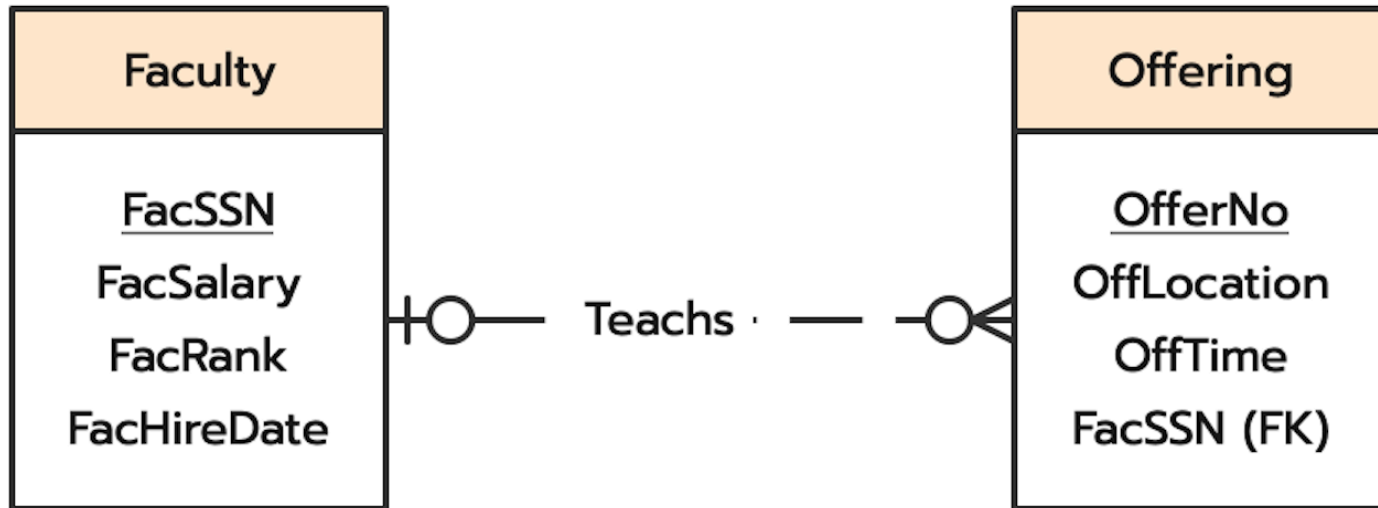
OPTIONAL & MANDATORY (1)



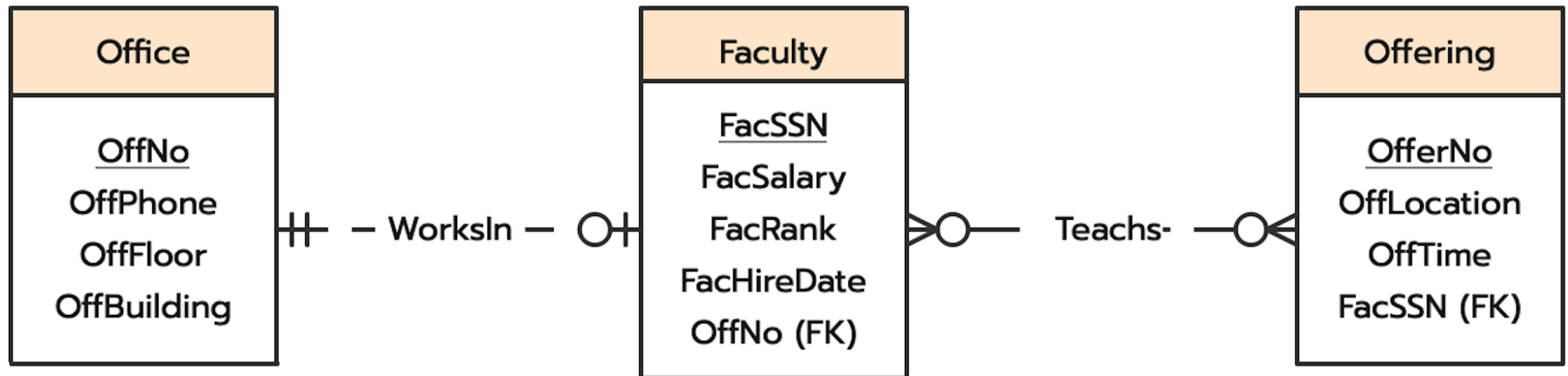
OPTIONAL & MANDATORY (2)



EXAMPLE 1



EXAMPLE 2

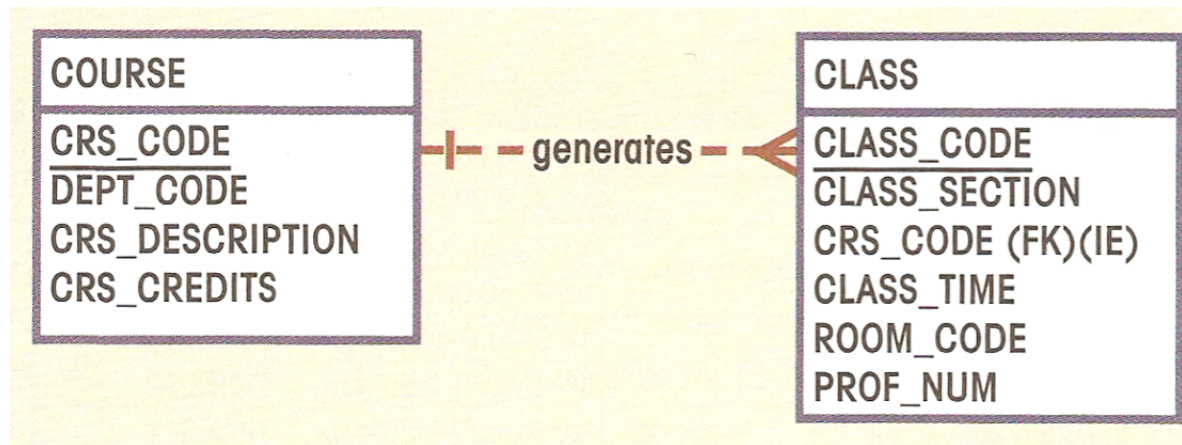


RELATIONSHIP STRENGTH (1)

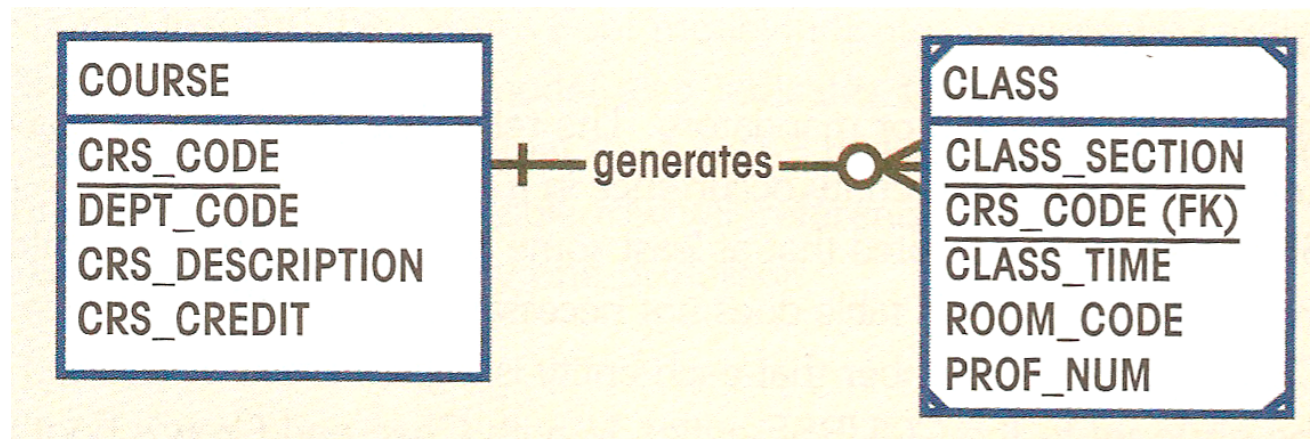
- Existence Dependence
 - Child entity existence dependent on existence of related parent entity.
 - Existence-independent entities can exist apart from related entities.
- Weak (Non-Identifying) Relationship
 - Entity is existence-independent of other entities.
- Strong (Identifying) Relationship
 - Child entity is existence-dependent on parent.

RELATIONSHIP STRENGTH (2)

Weak (Non-Identifying) Relationship



Strong (Identifying) Relationship

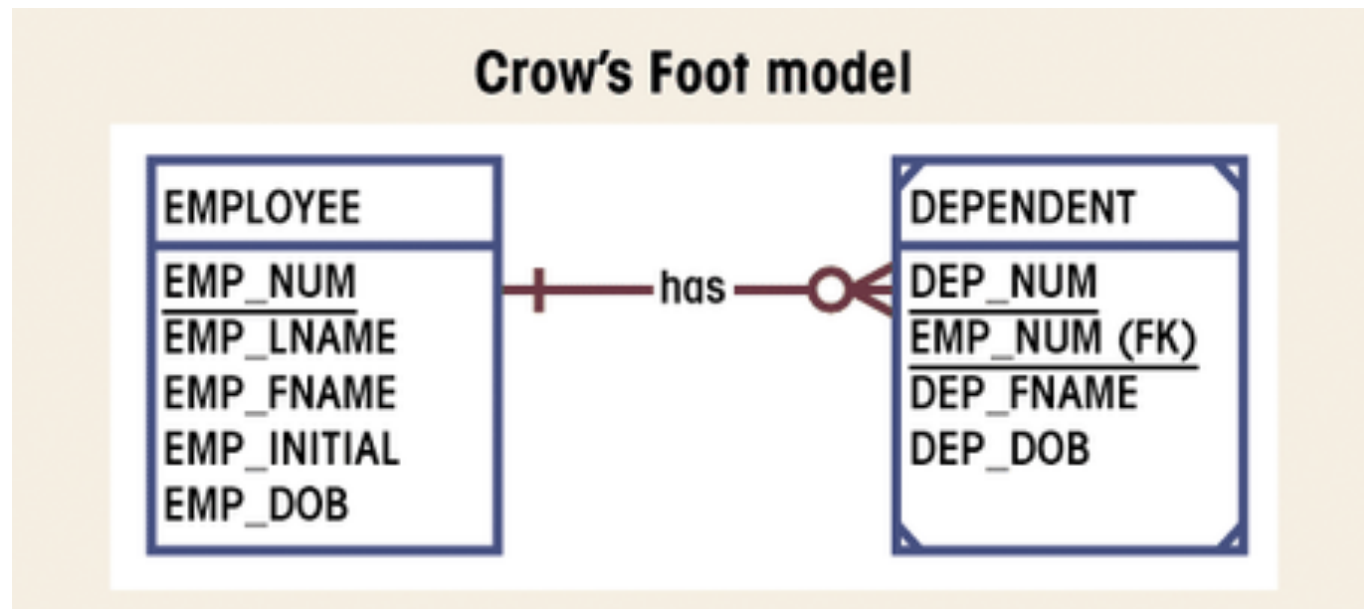


STRONG RELATIONSHIP & WEAK ENTITY

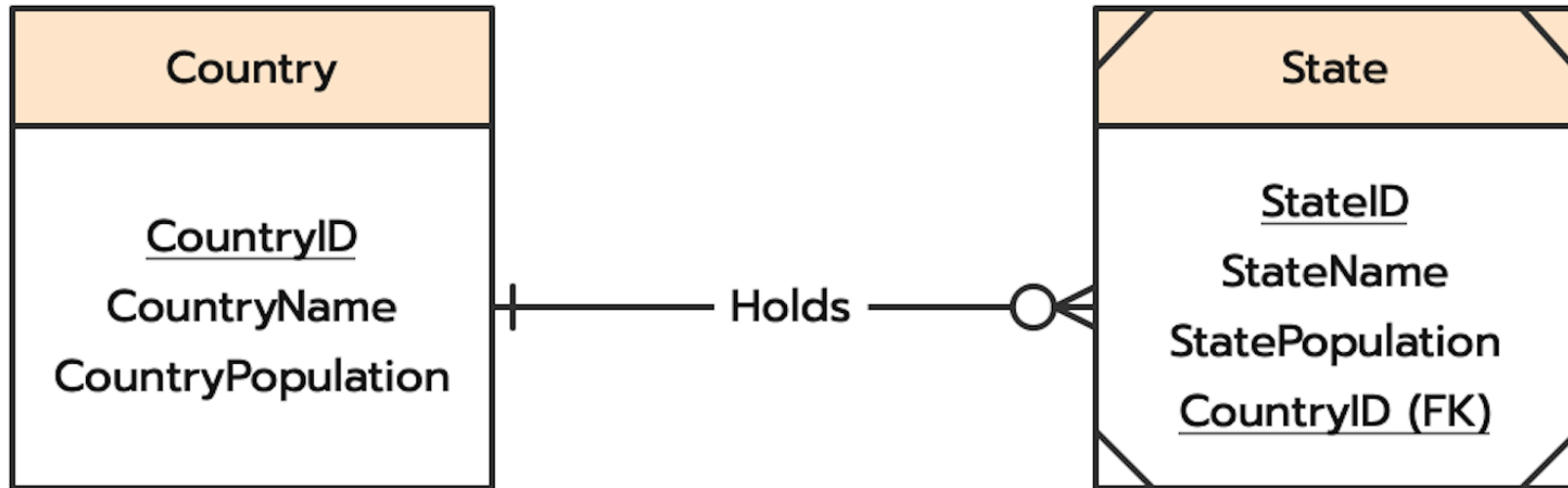
- An entity type that borrows all or part of its primary key from another entity type. Identifying relationships indicate the entity types that supply components of the borrowed primary key.

WEAK ENTITIES

- Existence-dependent on another entity
- Has primary key that is partially or totally derived from parent entity



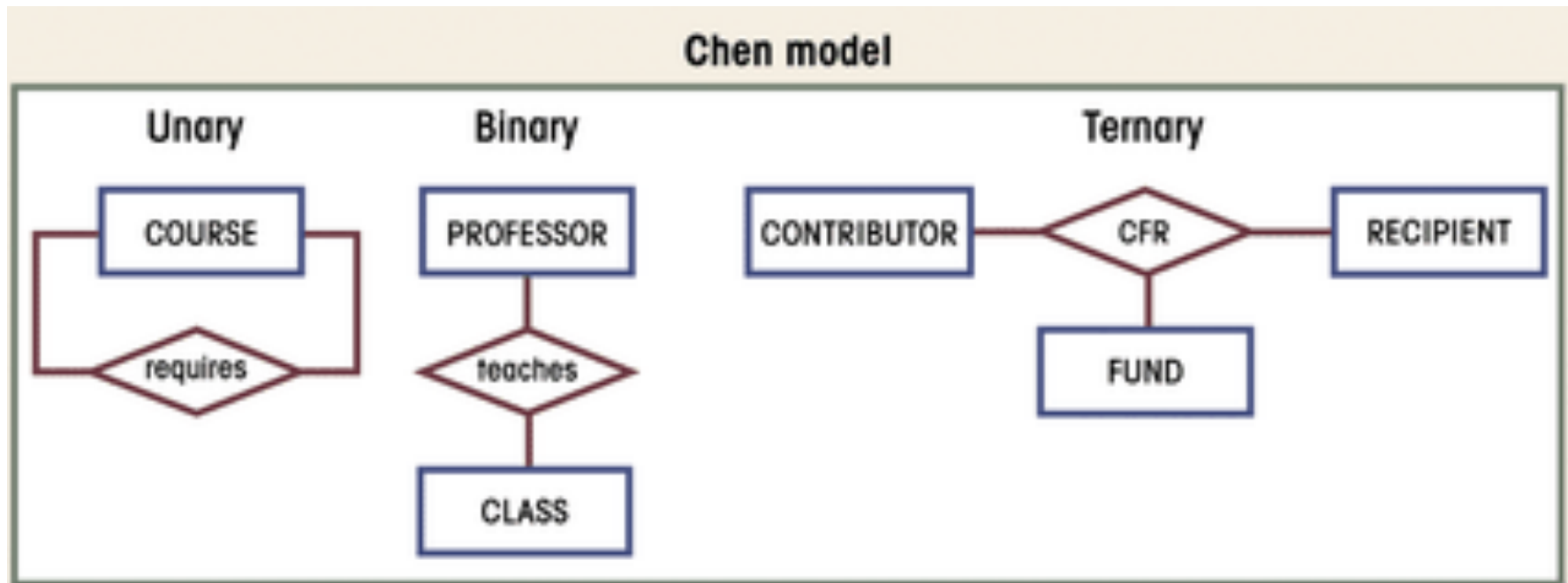
EXAMPLE 3



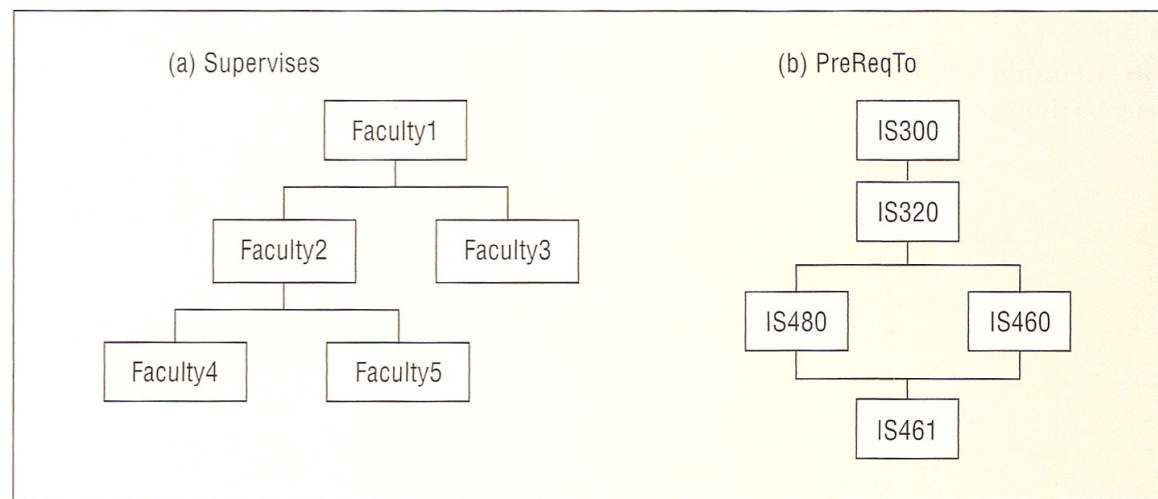
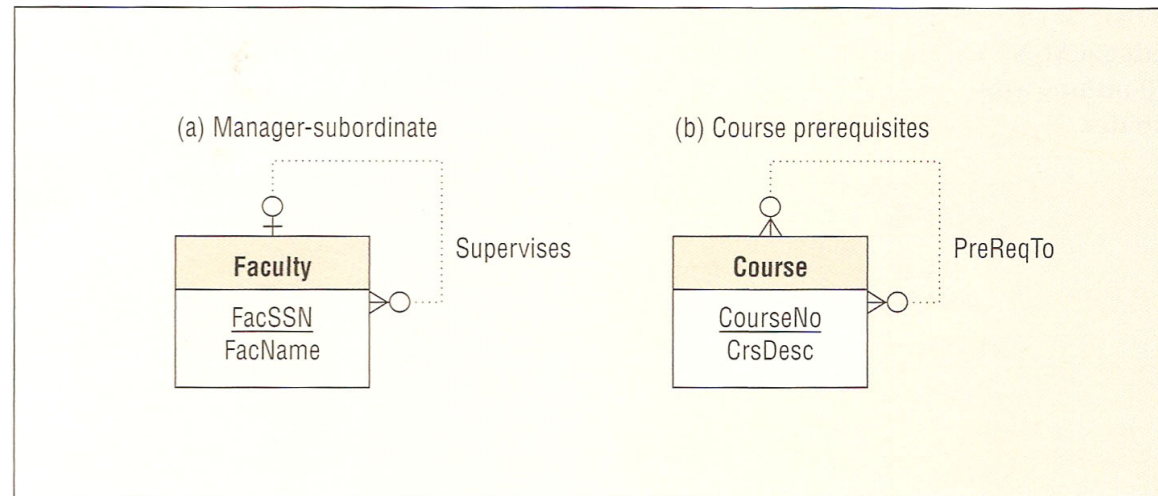
RELATIONSHIP DEGREE (1)

- Indicates number of associated entities
- Unary
 - Single entity
 - Recursive
 - Exists between occurrences of same entity set
- Binary
 - Two entities associated
- Ternary
 - Three entities associated

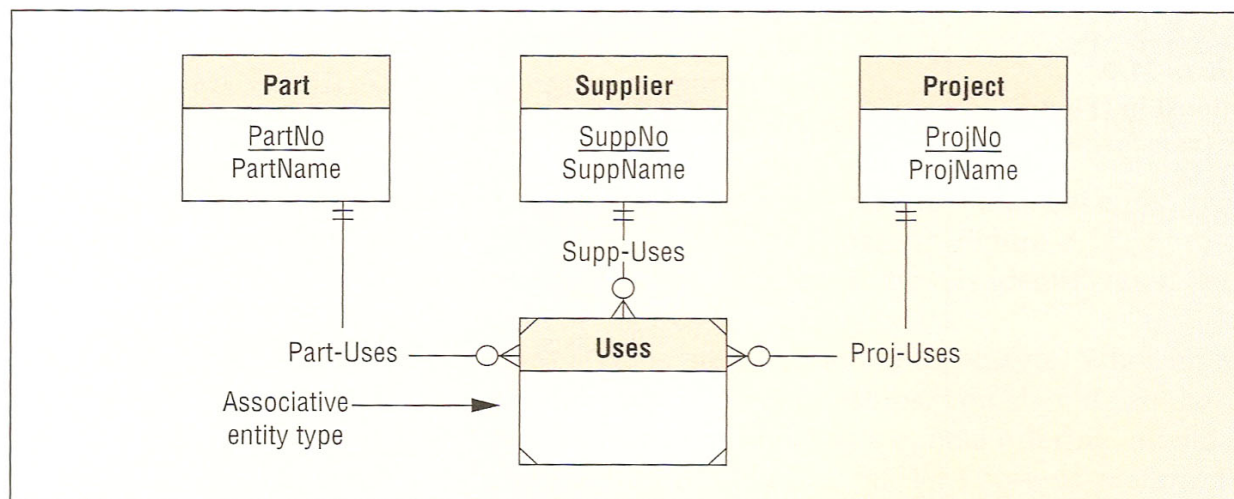
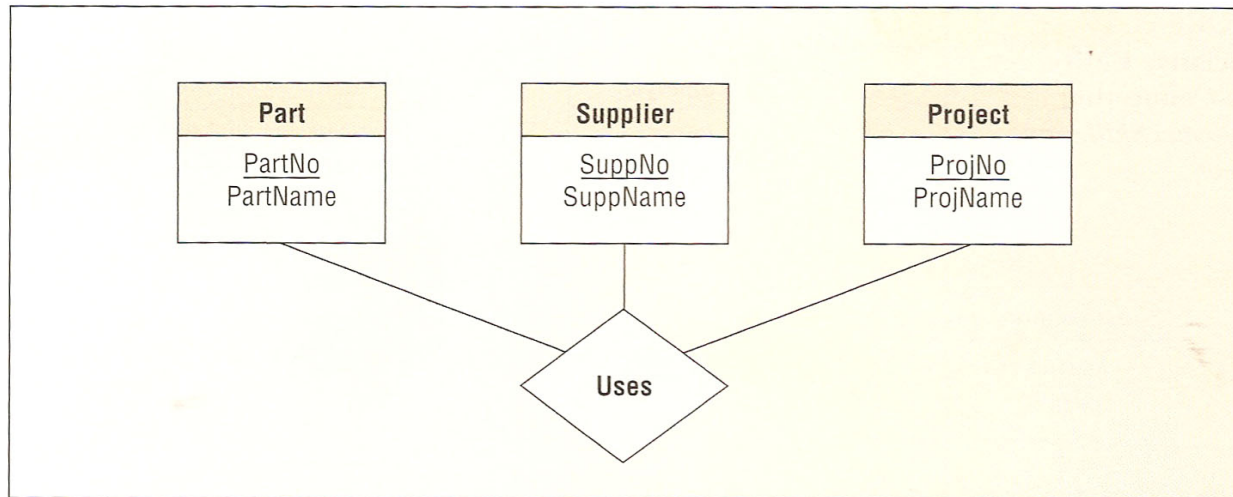
RELATIONSHIP DEGREE (2)



SELF REFERENCING (UNARY)



M-WAY (TERNARY) RELATIONSHIP

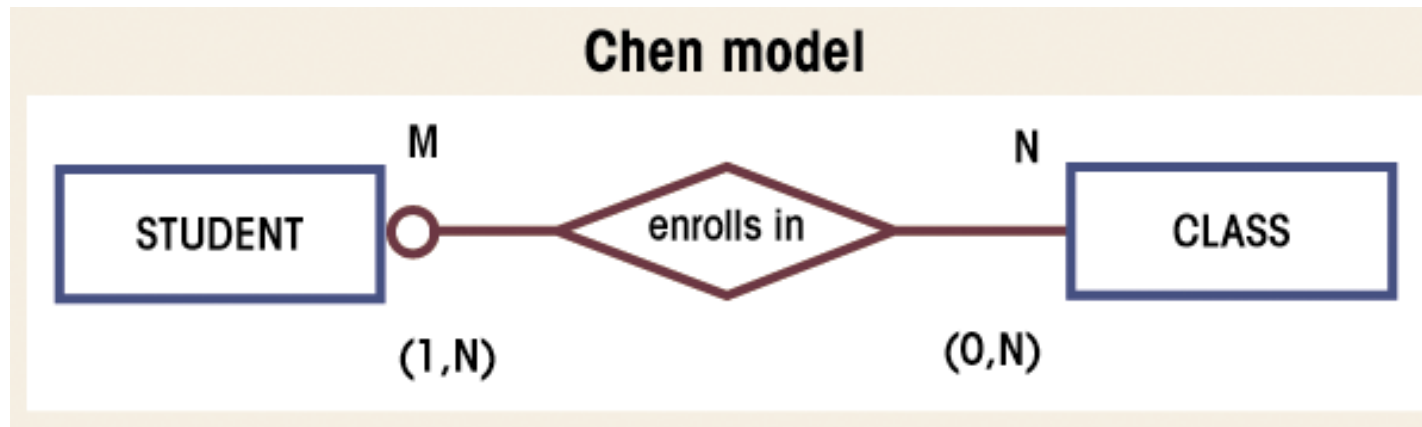


RELATIONSHIP EQUIVALENCE

- A M-N relationship can be replaced by an associative entity type and two identifying 1-M relationships. In most cases the choice between a M-N relationship and the associative entity type is personal preference.

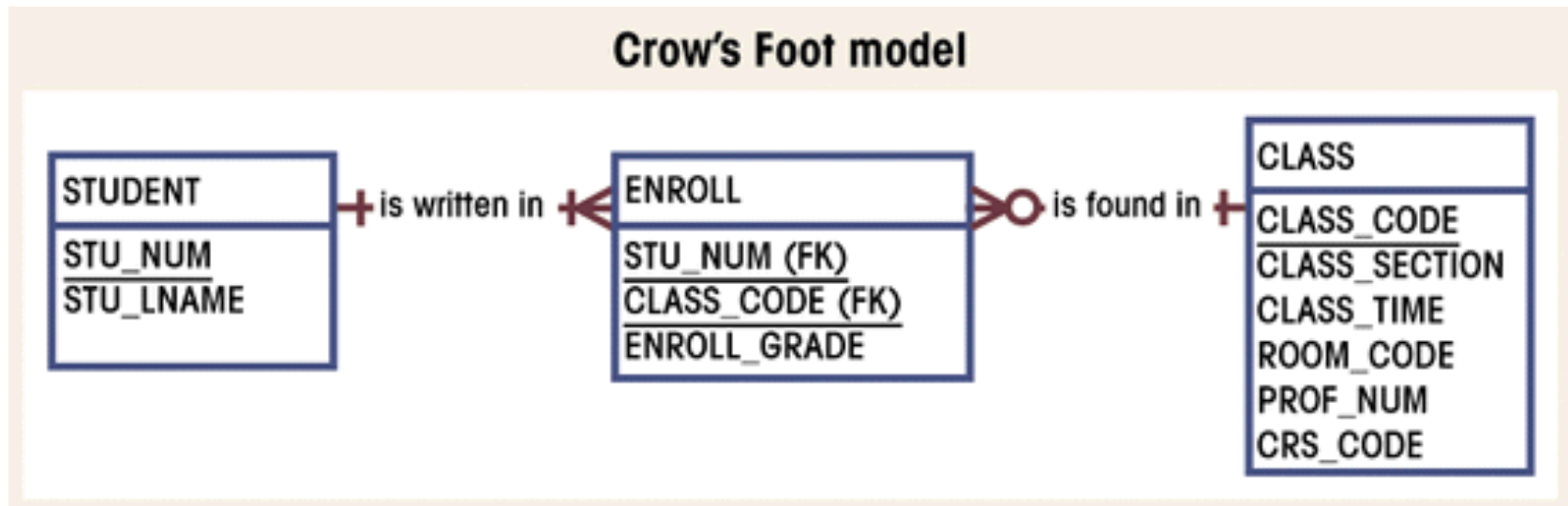
COMPOSITE ENTITIES (1)

- Used to 'bridge' between M:N relationships
- Bridge entities composed of primary keys of each entity needing connection

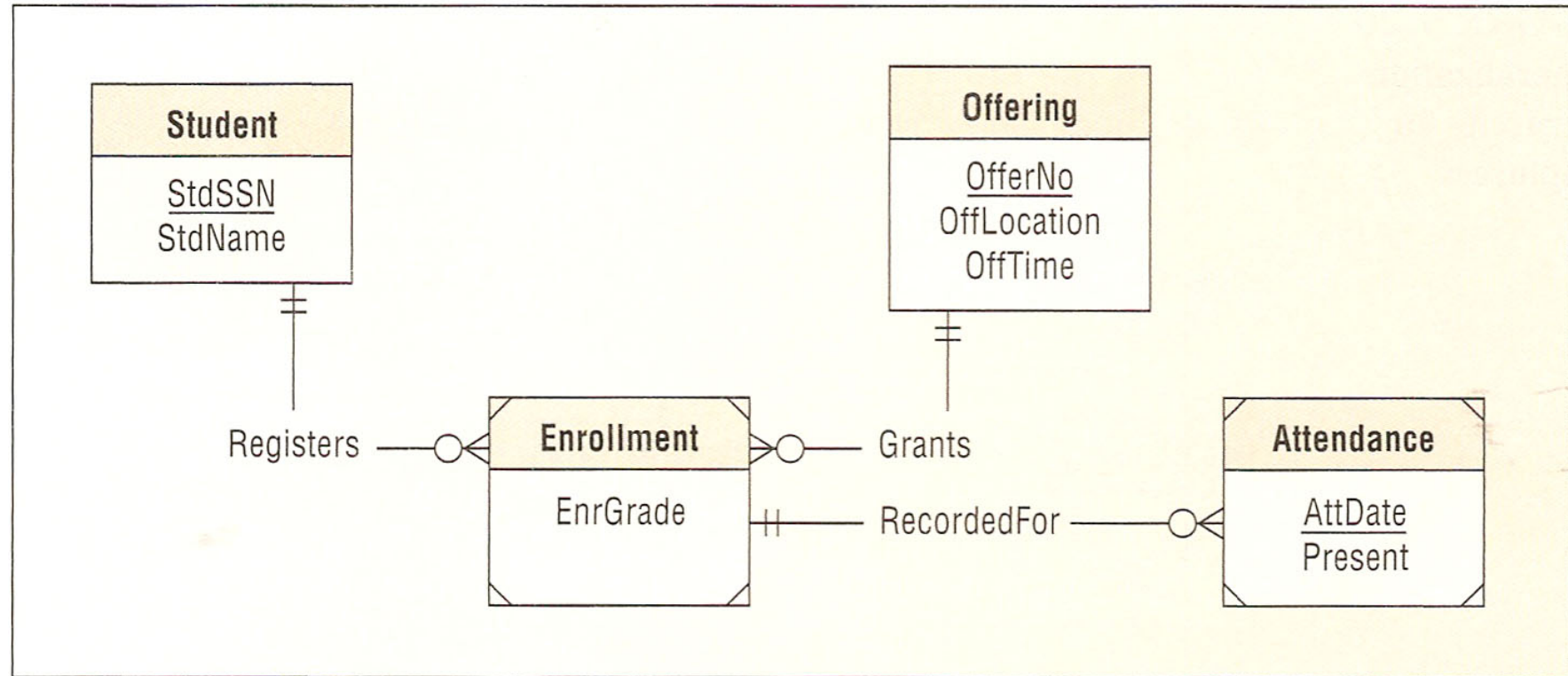


COMPOSITE ENTITIES (2)

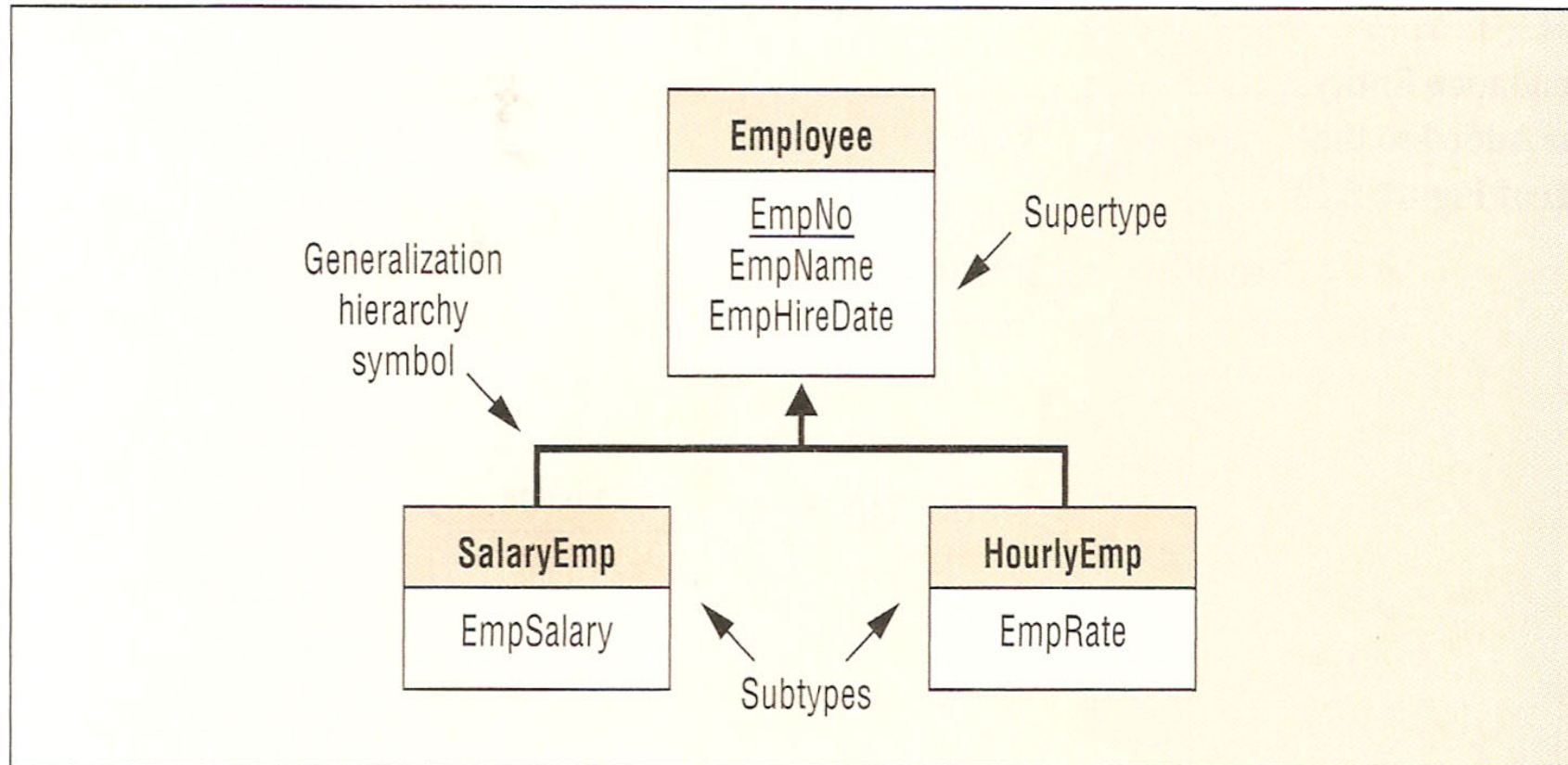
- M-N Relationship Transformed into 1-M Relationship



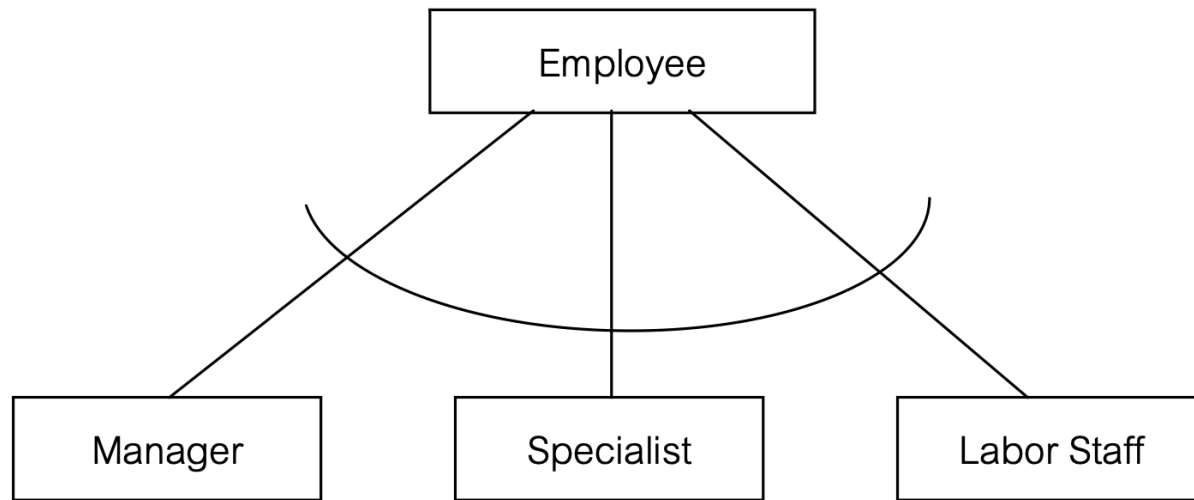
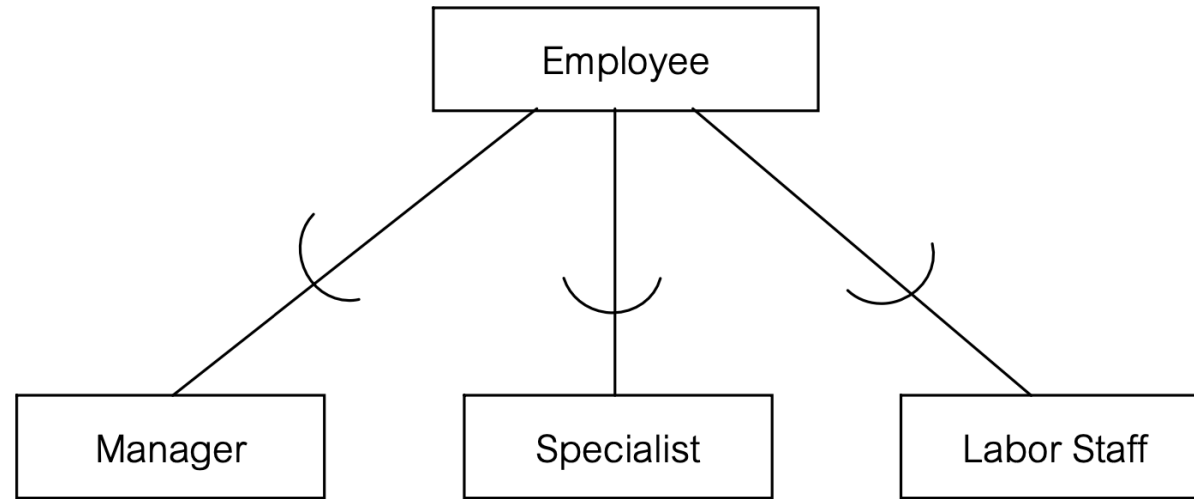
EXAMPLE 4



GENERALIZATION HIERARCHY (1)



GENERALIZATION HIERARCHY (2)



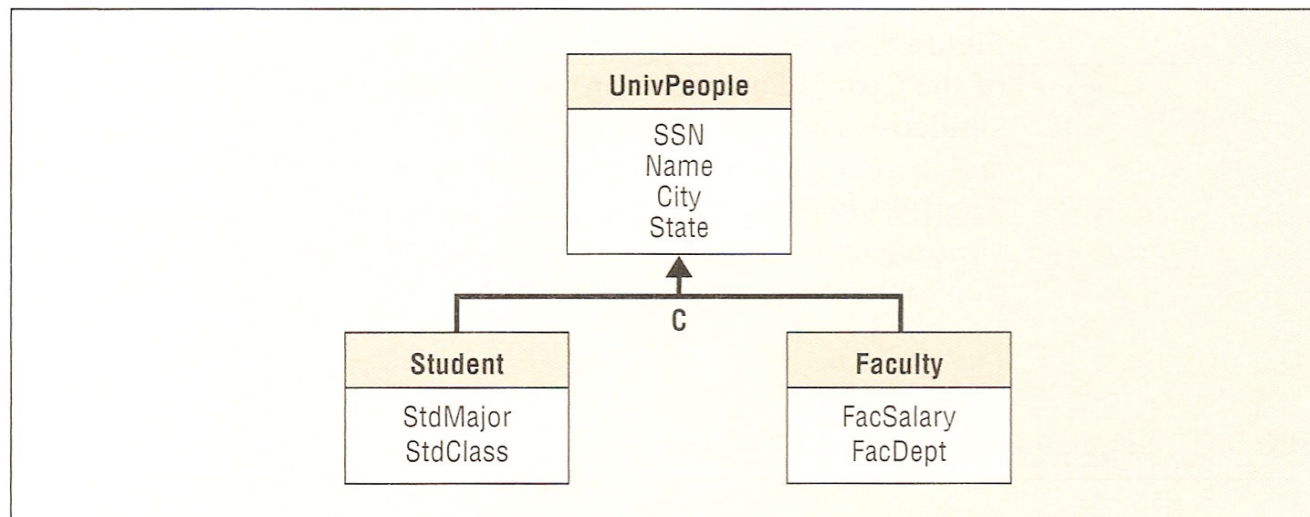
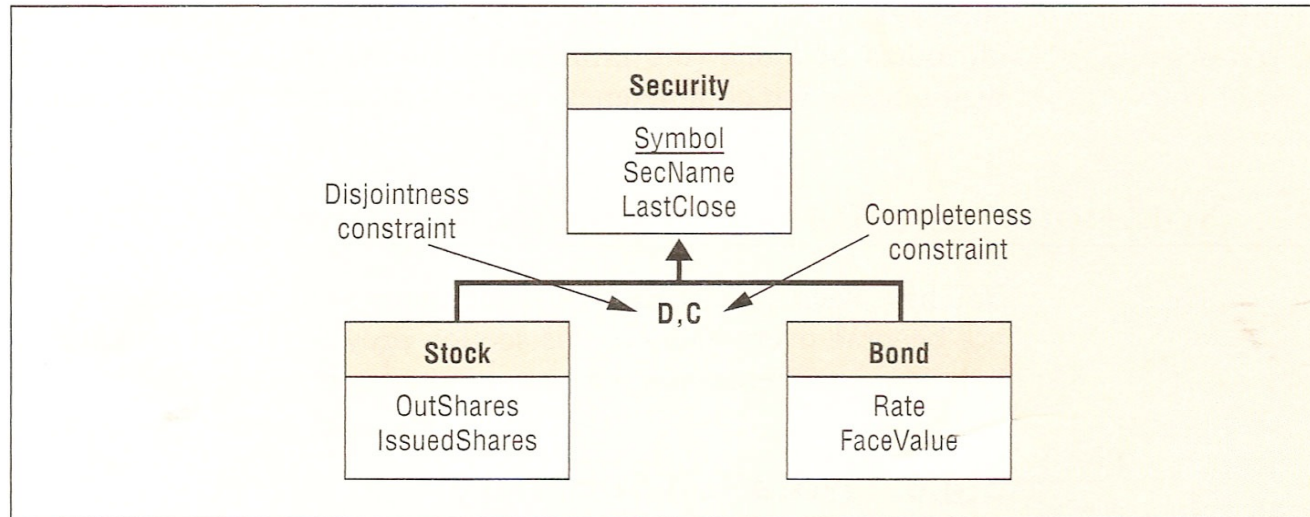
Chen Model

GENERALIZATION HIERARCHY (3)

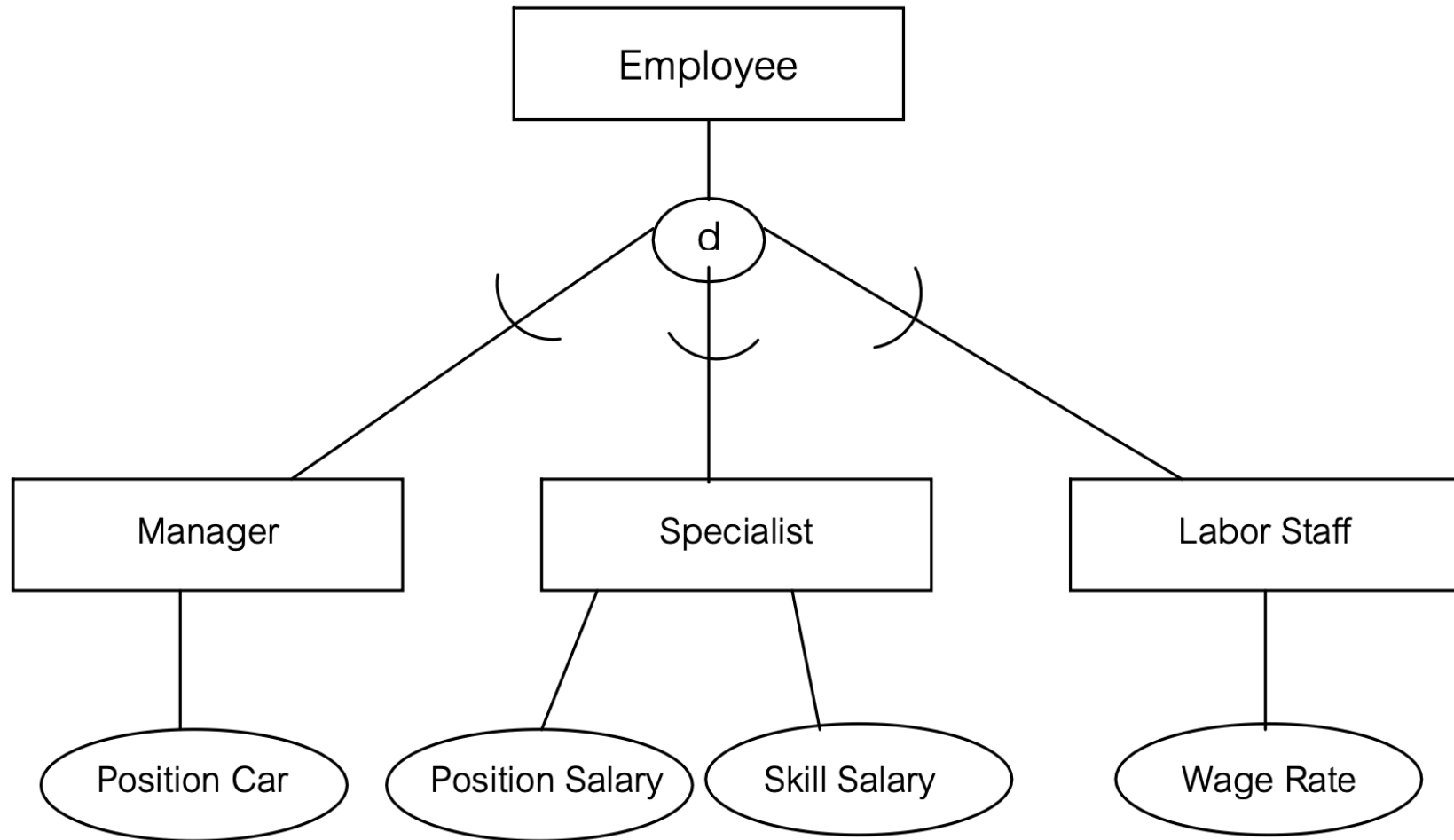


Crow's Foot Model

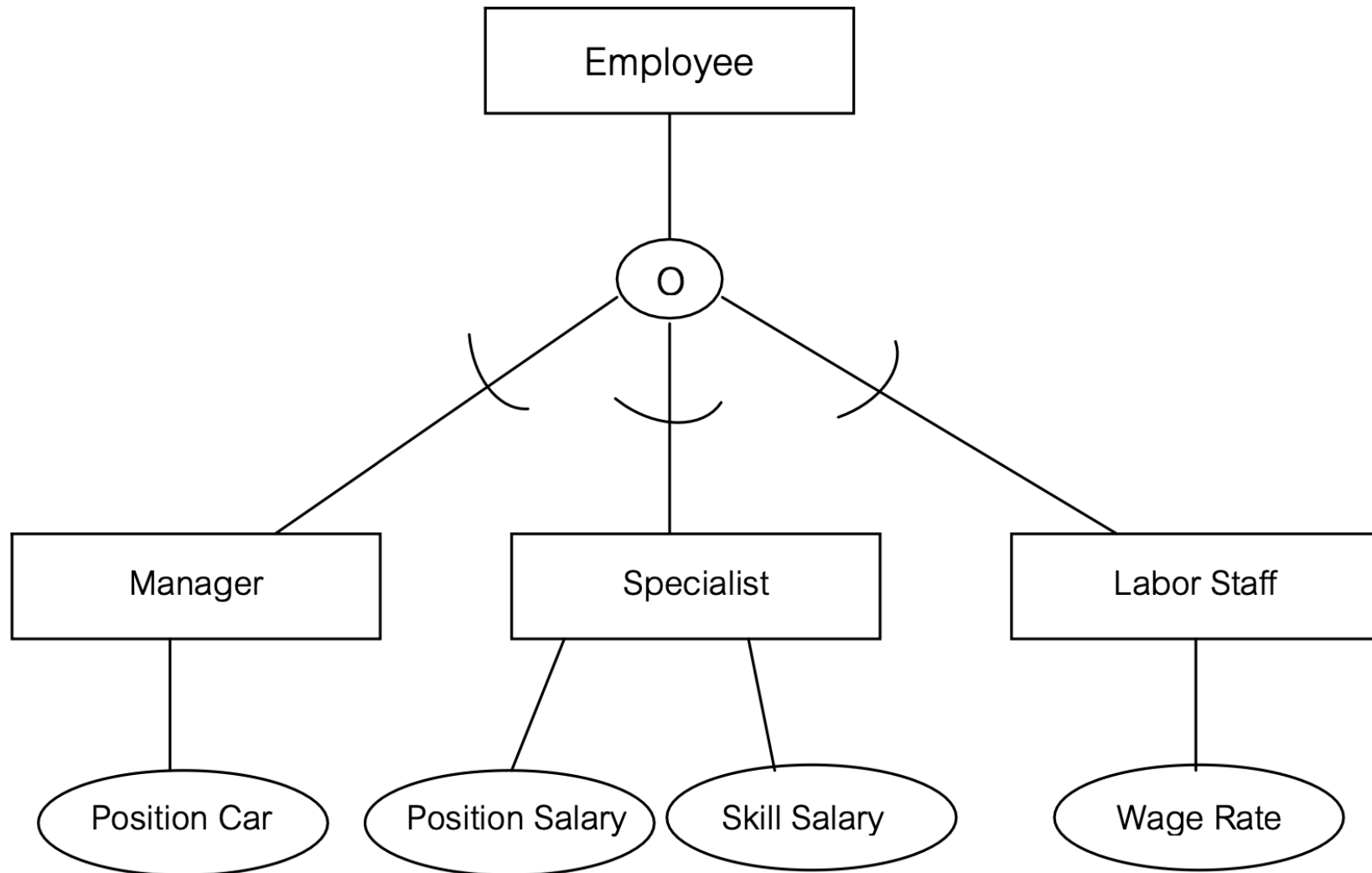
DISJOINTNESS AND COMPLETENESS



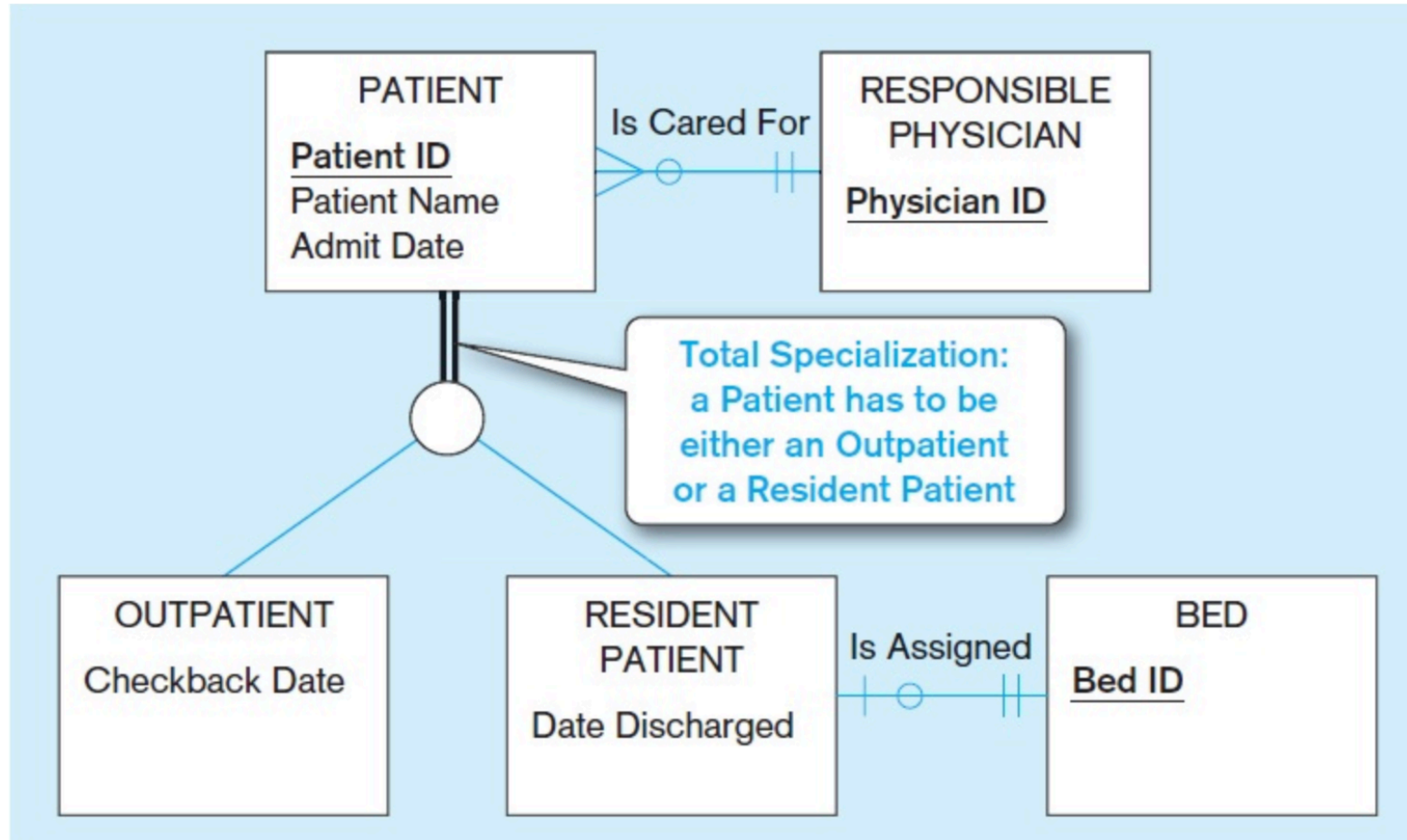
DISJOINTNESS/OVERLAPPING (1)



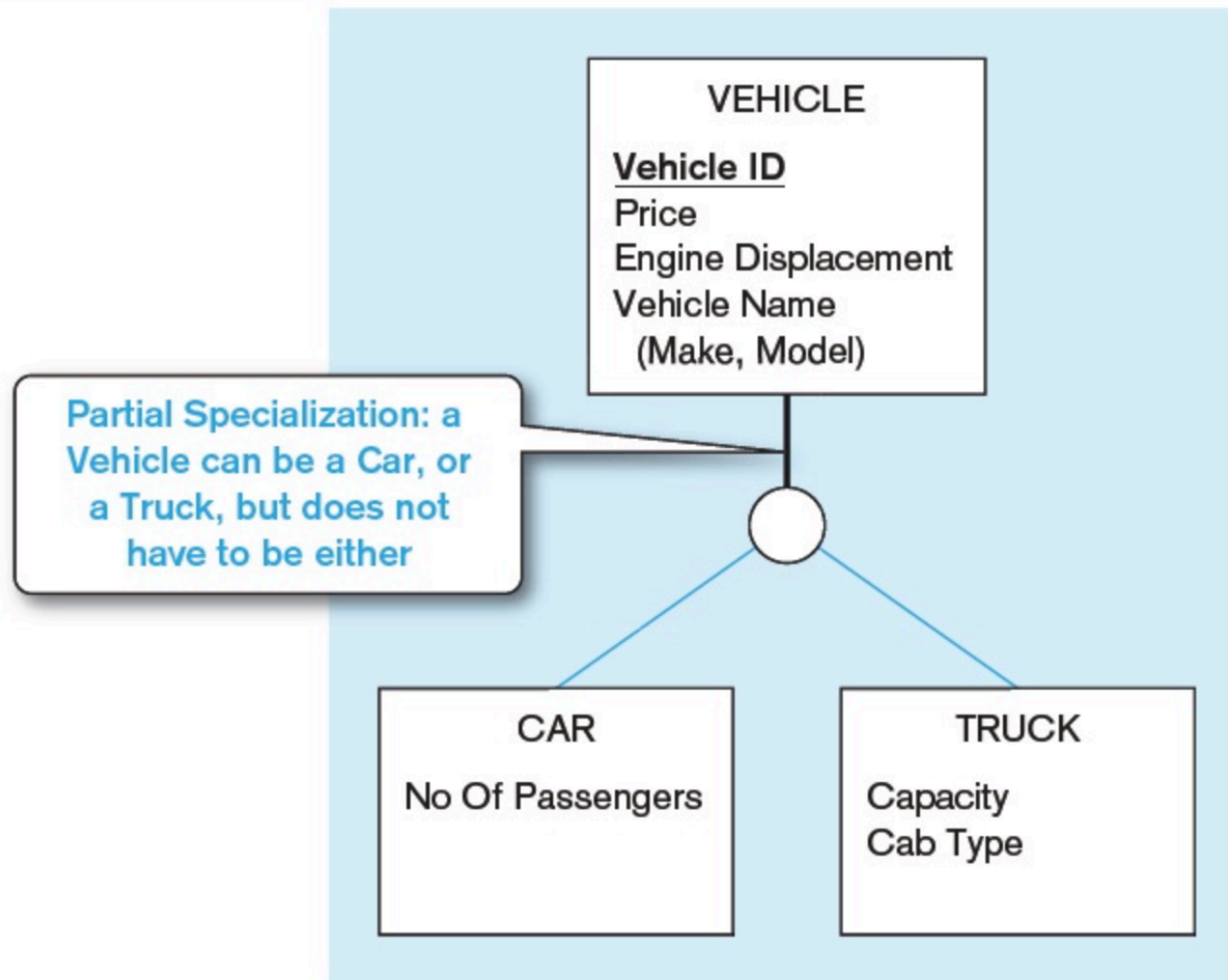
DISJOINTNESS/OVERLAPPING (2)



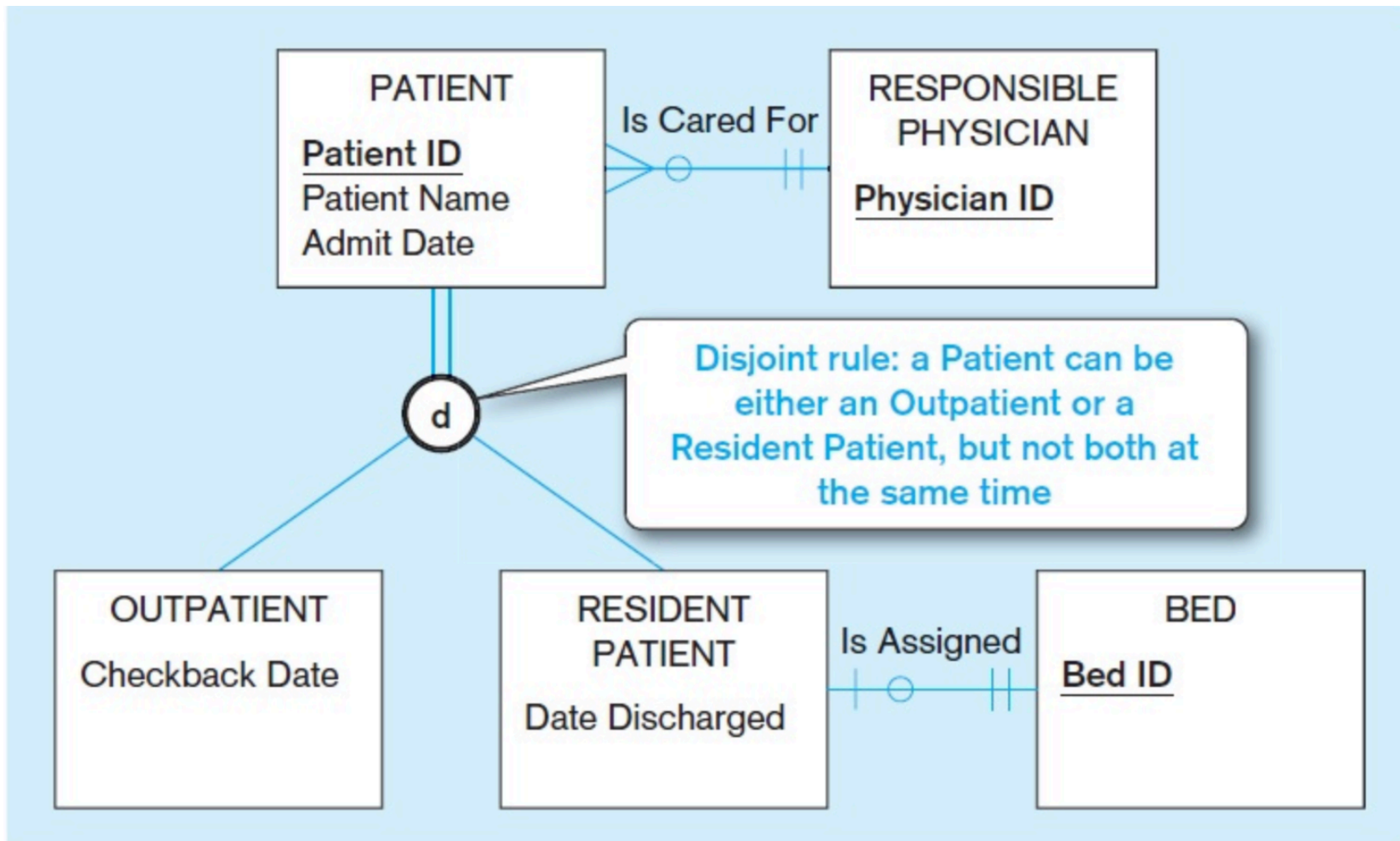
TOTAL COMPLETENESS



PARTIAL COMPLETENESS

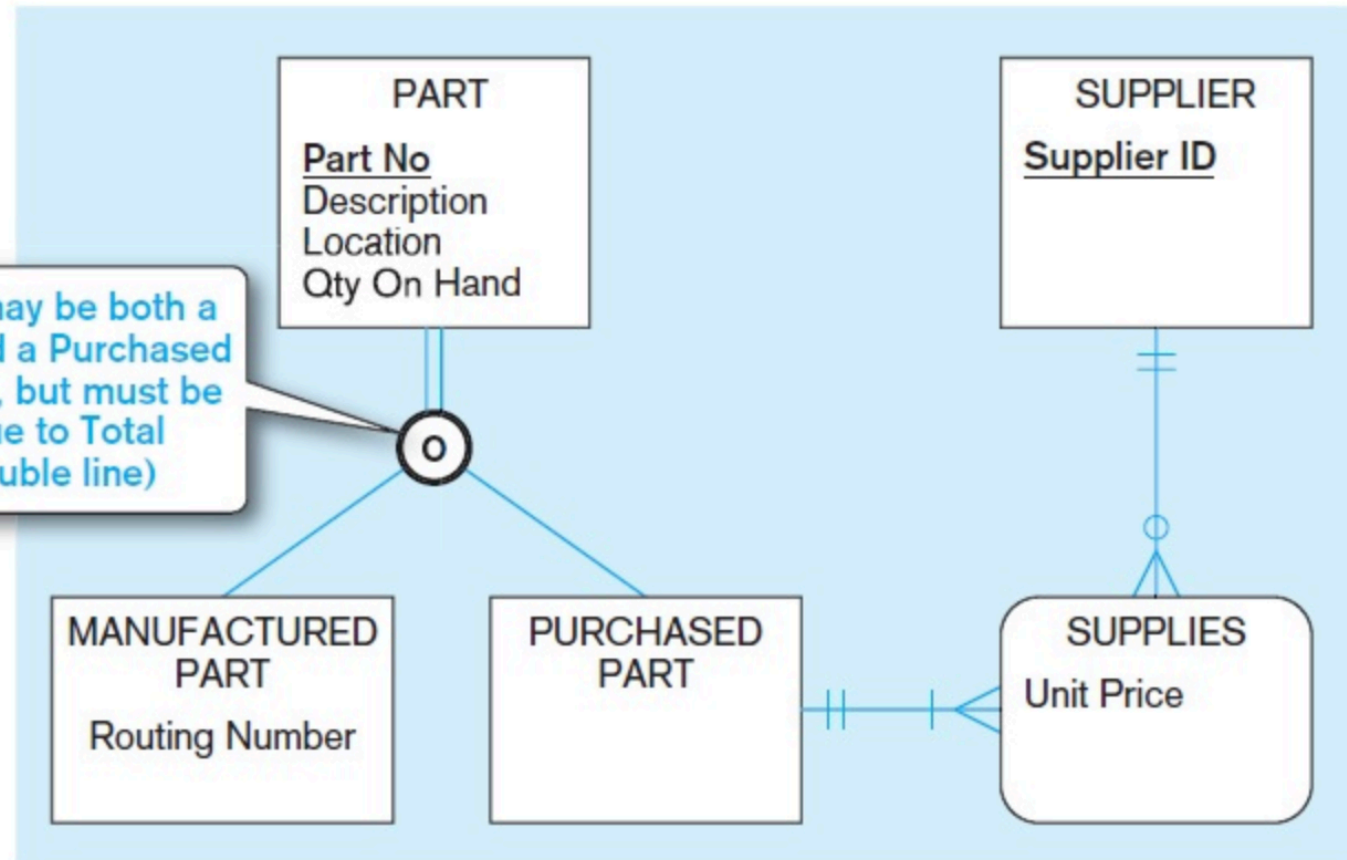


EXAMPLE 5

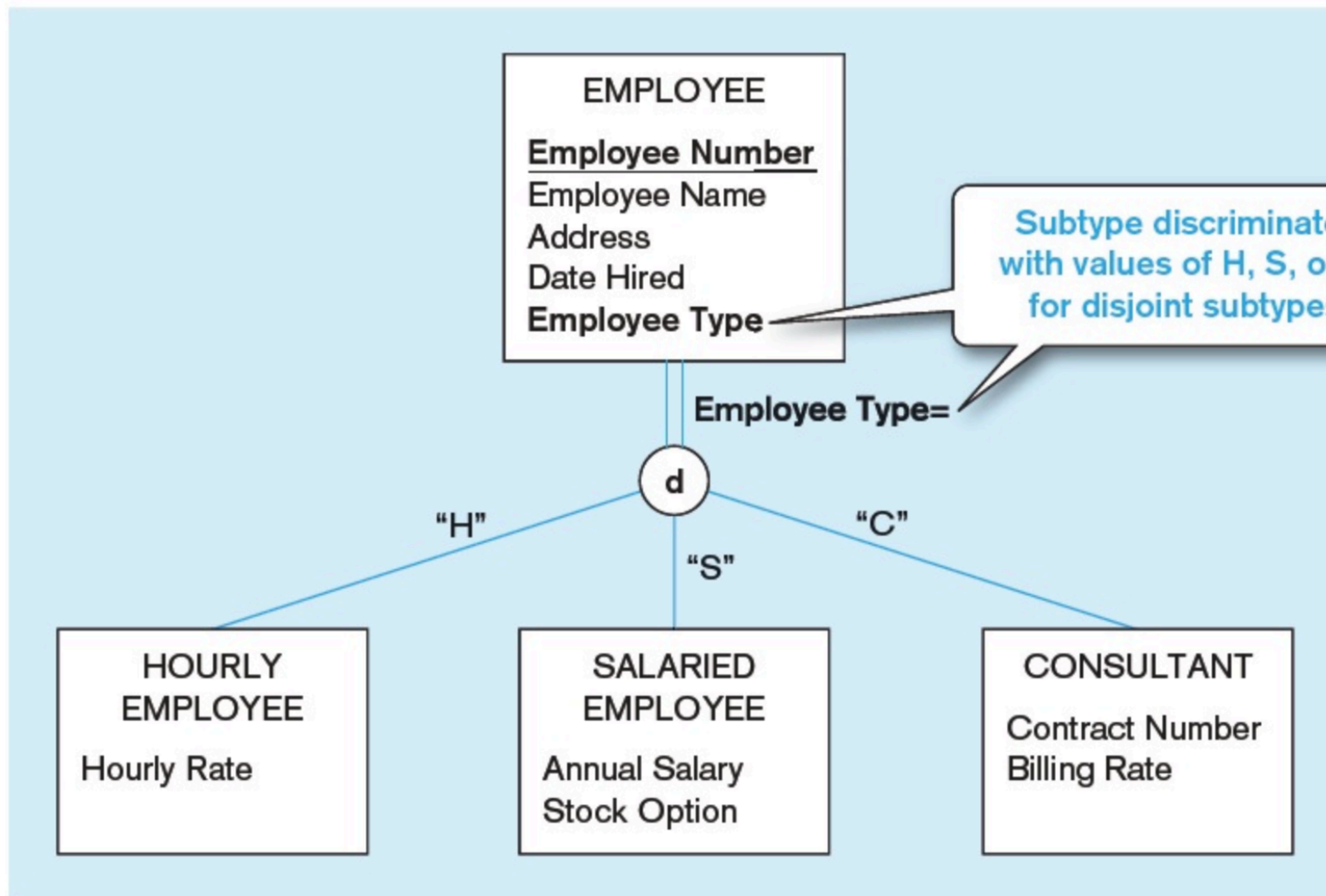


EXAMPLE 6

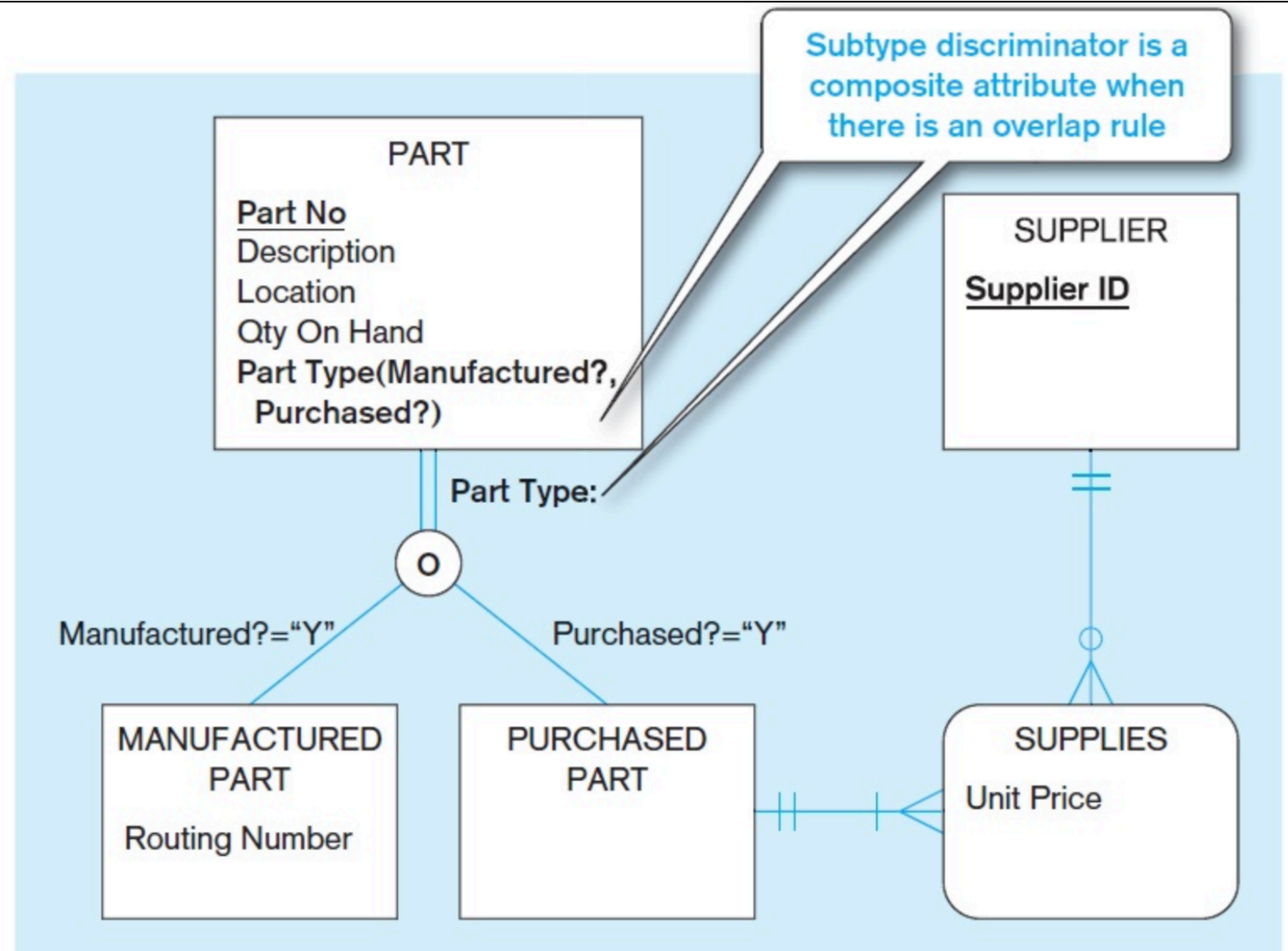
Overlap rule: a Part may be both a Manufactured Part and a Purchased Part at the same time, but must be one or the other due to Total Specialization (double line)



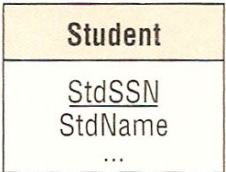
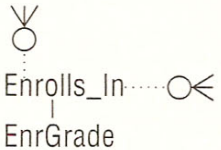
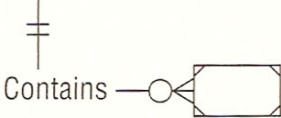




EXAMPLE 7



EXAMPLE 8



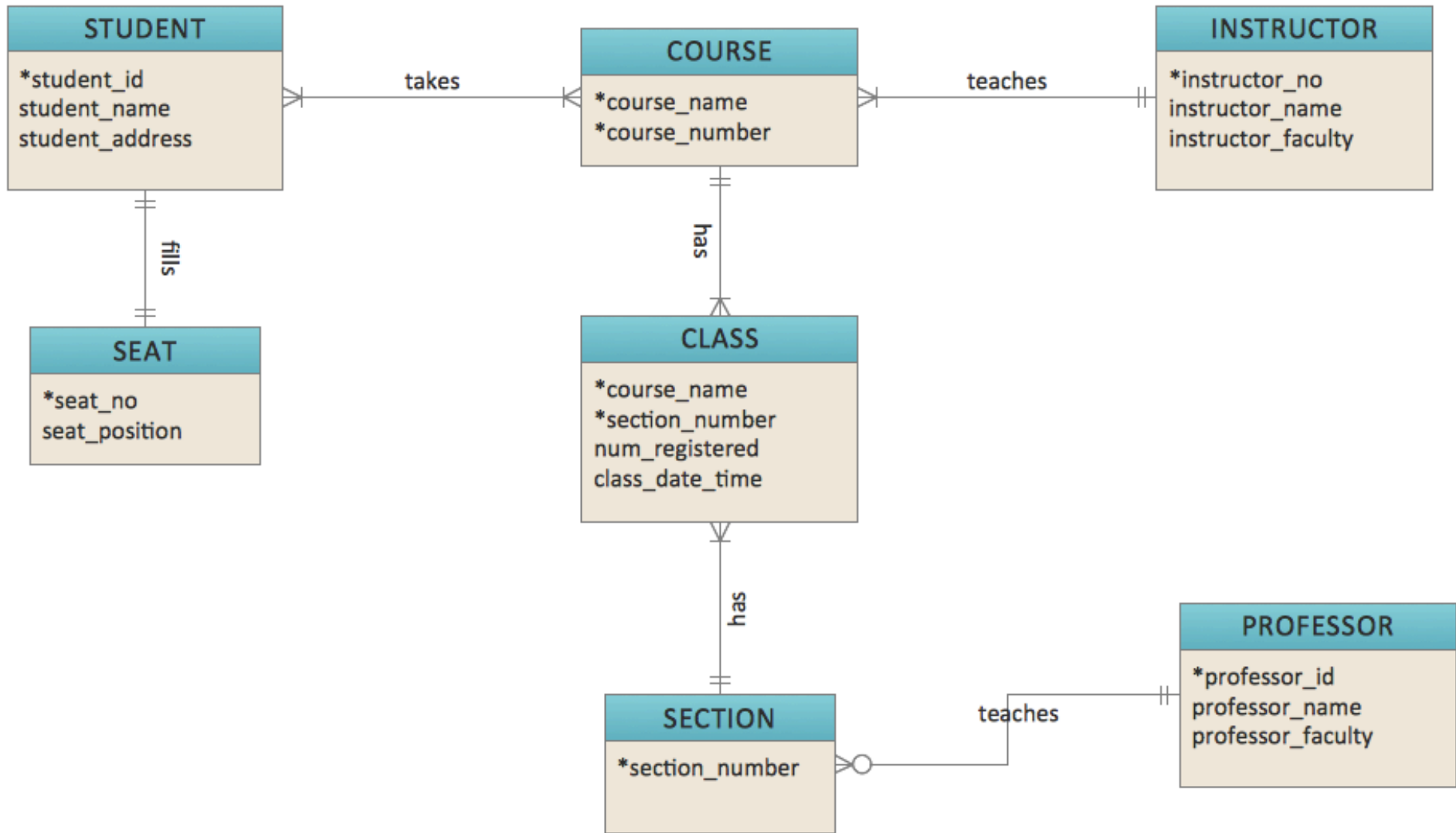
SUMMARY OF CROW'S FOOT NOTATION

Symbol	Meaning
	Entity type with attributes (primary key underlined).
	M-N relationship with attributes: attributes are shown if room permits; otherwise attributes are listed separately.
	Identification dependency: identifying relationship(s) (solid relationship lines) and weak entity (diagonal lines in the corners of the rectangle). Associative entity types also are weak because they are (by definition) identification dependent.
	Generalization hierarchy with disjointness and completeness constraints.
	Existence dependent cardinality (minimum cardinality of 1): inner symbol is a line perpendicular to the relationship line.
	Optional cardinality (minimum cardinality of 0): inner symbol is a circle.
	Single-valued cardinality (maximum cardinality of 1): outer symbol is a perpendicular line.

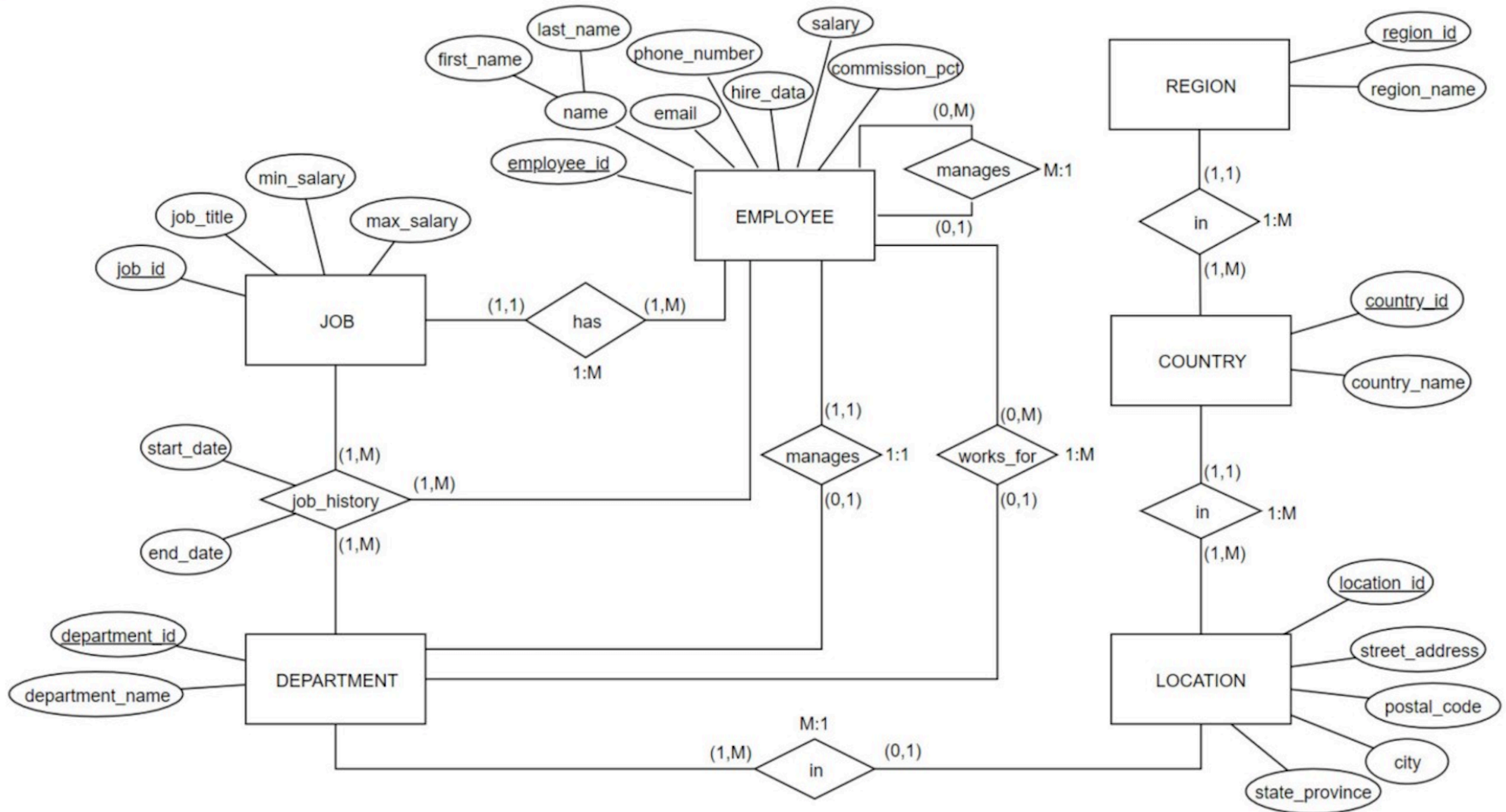
COMPARISON OF E-R MODELING SYMBOLS

	Chen	Crow's Foot	Rein85	IDEF1X
Entity				
Relationship line				
Relationship				
Option symbol				
One (1) symbol	1			
Many (M) symbol	M			
Composite entity				
Weak entity				

EXAMPLE 9



EXAMPLE 10



EXAMPLE 11

- Draw the entity relationship diagram for the sample data.

Table name: EMPLOYEE

Database name: CH2_STORE_CO

	EMP_CODE	EMP_TITLE	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_DOB	STORE_CODE
▶ ⊕	1	Mr.	vWilliamson	John	vW	21-May-64	3
⊕	2	Ms.	Ratula	Nancy		09-Feb-69	2
⊕	3	Ms.	Greenboro	Lottie	R	02-Oct-61	4
⊕	4	Mrs.	Rumpersfro	Jennie	S	01-Jun-71	5
⊕	5	Mr.	Smith	Robert	L	23-Nov-59	3
⊕	6	Mr.	Renselaer	Cary	A	25-Dec-65	1
⊕	7	Mr.	Ogallo	Roberto	S	31-Jul-62	3
⊕	8	Ms.	Johnsson	Elizabeth	I	10-Sep-68	1
⊕	9	Mr.	Eindsmar	Jack	vW	19-Apr-55	2
⊕	10	Mrs.	Jones	Rose	R	06-Mar-66	4
⊕	11	Mr.	Broderick	Tom		21-Oct-72	3
⊕	12	Mr.	vWashington	Alan	Y	08-Sep-74	2
⊕	13	Mr.	Smith	Peter	N	25-Aug-64	3
⊕	14	Ms.	Smith	Sherry	H	25-May-66	4
⊕	15	Mr.	Olenko	Howard	U	24-May-64	5
⊕	16	Mr.	Archialo	Barry	V	03-Sep-60	5
⊕	17	Ms.	Grimaldo	Jeanine	K	12-Nov-70	4
⊕	18	Mr.	Rosenberg	Andrew	D	24-Jan-71	4
⊕	19	Mr.	Rosten	Peter	F	03-Oct-68	4
⊕	20	Mr.	Mckee	Robert	S	06-Mar-70	1
⊕	21	Ms.	Baumann	Jennifer	A	11-Dec-74	3

Table name: STORE

	STORE_CODE	STORE_NAME	STORE_YTD_SALES	REGION_CODE	EMP_CODE
▶ ⊕	1	Access Junction	\$1,003,455.76	2	8
⊕	2	Database Corner	\$1,421,987.39	2	12
⊕	3	Tuple Charge	\$986,783.22	1	7
⊕	4	Attribute Alley	\$944,568.56	2	3
⊕	5	Primary Key Point	\$2,930,098.45	1	15

Table name: REGION

	REGION_CODE	REGION_DESCRIPT
▶ ⊕	1	East
⊕	2	vWest

EXAMPLE 12

- Draw the entity relationship diagram for the sample data; DreamHome.

SAMPLE DATA - DREAMHOME (1)

Branch

branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B007	16 Argyll St	Aberdeen	AB2 3SU
B003	163 Main St	Glasgow	G11 9QX
B004	32 Manse Rd	Bristol	BS99 1NZ
B002	56 Clover Dr	London	NW10 6EU

Staff

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	B005

SAMPLE DATA - DREAMHOME (2)

PropertyForRent

propertyNo	street	city	postcode	type	rooms	rent	ownerNo	staffNo	branchNo
PA14	16 Holhead	Aberdeen	AB7 5SU	House	6	650	CO46	SA9	B007
PL94	6 Argyll St	London	NW2	Flat	4	400	CO87	SL41	B005
PG4	6 Lawrence St	Glasgow	G11 9QX	Flat	3	350	CO40		B003
PG36	2 Manor Rd	Glasgow	G32 4QX	Flat	3	375	CO93	SG37	B003
PG21	18 Dale Rd	Glasgow	G12	House	5	600	CO87	SG37	B003
PG16	5 Novar Dr	Glasgow	G12 9AX	Flat	4	450	CO93	SG14	B003

Client

clientNo	fName	IName	telNo	prefType	maxRent
CR76	John	Kay	0207-774-5632	Flat	425
CR56	Aline	Stewart	0141-848-1825	Flat	350
CR74	Mike	Ritchie	01475-392178	House	750
CR62	Mary	Tregear	01224-196720	Flat	600

SAMPLE DATA - DREAMHOME (3)

PrivateOwner

ownerNo	fName	lName	address	telNo
CO46	Joe	Keogh	2 Fergus Dr, Aberdeen AB2 7SX	01224-861212
CO87	Carol	Farrel	6 Achray St, Glasgow G32 9DX	0141-357-7419
CO40	Tina	Murphy	63 Well St, Glasgow G42	0141-943-1728
CO93	Tony	Shaw	12 Park Pl, Glasgow G4 0QR	0141-225-7025

Viewing

clientNo	propertyNo	viewDate	comment
CR56	PA14	24-May-04	too small
CR76	PG4	20-Apr-04	too remote
CR56	PG4	26-May-04	
CR62	PA14	14-May-04	no dining room
CR56	PG36	28-Apr-04	

Registration

clientNo	branchNo	staffNo	dateJoined
CR76	B005	SL41	2-Jan-04
CR56	B003	SG37	11-Apr-03
CR74	B003	SG37	16-Nov-02
CR62	B007	SA9	7-Mar-03

ASSIGNMENT 1

- Suppose you are given the following requirements for a simple database for the English Premier League (EPL):
 - The EPL has many team (20 teams).
 - Each team has a name, a city, a manager, a captain, and a set of players.
 - Each player belongs to only one team.
 - Each player has a name, a number, and a position (such as goalkeeper or midfielder)
 - A team captain is also a player.
 - A game is played between two teams (referred to as host team and guest team) and a date and score.
- Create an ERD to support EPL data using **draw.io**, export it as a PDF, and send it to my email (kanat@egco.org)