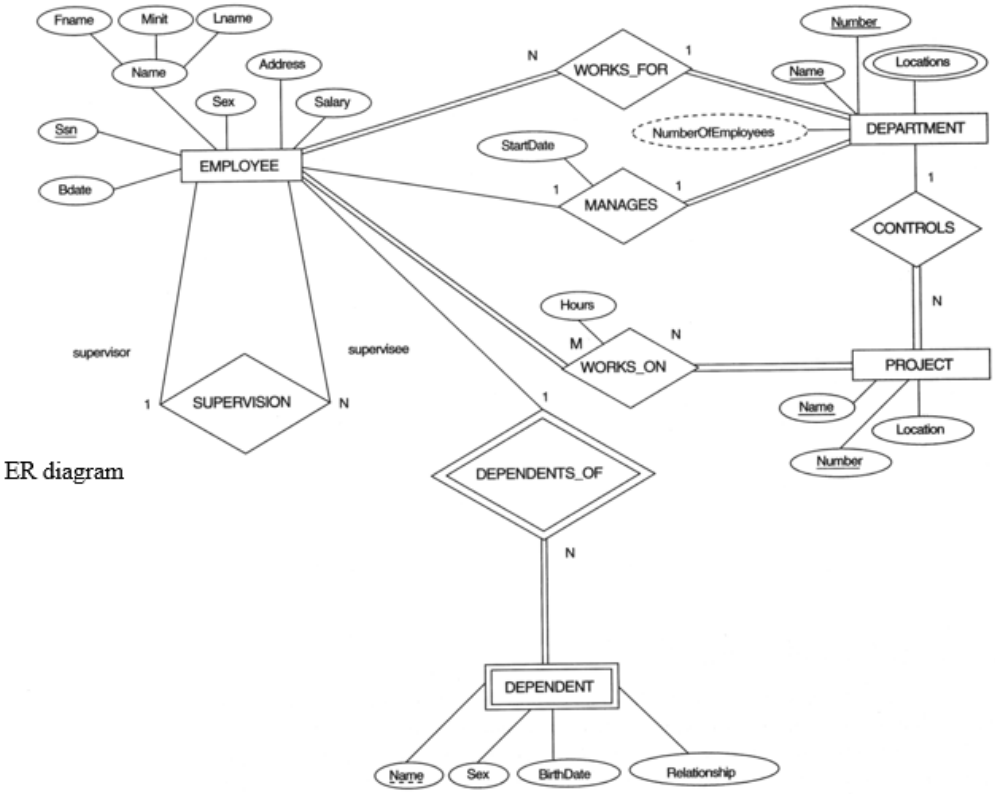
配分：[20.00]	得分：	1. Which concepts are not supported by the ER model? a. Entity type b. specialization c. superclass d. Relationship
配分：[20.00]	得分：	2. Maximum cardinality about relationship types is also known as participation constraints. a.
配分：[20.00]	得分：	3. The process of defining a set of subclasses of a superclass is referred to as _____. a. inheritance b. generalization c. enhanced ER model d. specialization
配分：[20.00]	得分：	4. In general, an n-ary relationship is not equivalent to n binary relationships. a.
配分：[20.00]	得分：	5. That both participations are same entity type in different roles is referred to as _____. a. entity type b. relationship c. recursive relationship types d. weak entity type

配分：[20.00]	得分：	1. What options can the disjointness constraint have in the EER model? a. Overlapping b. Disjoint c. Total participation. d. Partial participation.
配分：[20.00]	得分：	2. A single superclass/subclass relationship with more than one superclass is referrred to as _____. a. disjointness b. multiple inheritance

		c. a shared subclass d. a union type
配分： [20.00]	✓ 得分：	3. Which types of relationship do we need to map the relationship type to a new relation in the relational schema? a. A binary 1:N relationship type b. An N-ary relationship type. c. A binary 1:1 relationship type d. A binary M:N relationship type
配分： [20.00]	✓ 得分：	4. Which structure allows multiple inheritance? a. A hierarchy b. A lattice c. A tree d. A category
配分： [20.00]	✓ 得分：	5. To map a multi-valued attribute in an ER diagram to the relational diagram, we need to create a new relation for the multi-valued attribute. ○ a. ✗
配分： [20.00]	✓ 得分：	1. What impedance mismatches are between a host programming and the database model? a. Sequential statements b. Set-at-a-time vs. record-at-a-time c. Type mismatch and incompatibilities d. Variables and constants
配分： [20.00]	✗ 得分：	2. In mapping of shared subclasses to relations in the EER diagram, we can apply Step 8A which maps the shared subclass to a separate relation. ○ a. ✗
配分： [20.00]	✓ 得分：	3. Dynamic SQL executes new SQL (not previously compiled) statements at run-time. ○ a. ✗
配分： [20.00]	✓ 得分：	4. Which database programming approach calls database functions in the library for accessing the DB? a. Call Level Interface (CLI) b. Embedded SQL

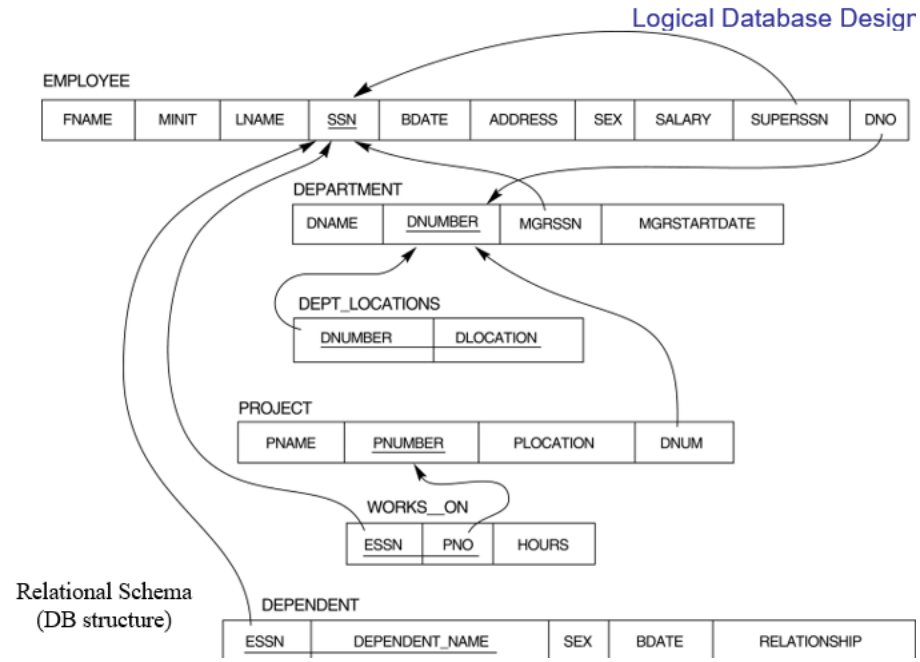
		c. A brand new, full-fledged language d. Stored procedures and functions
配分： [20.00]	得分：	5. Which statement can be used to change from an active DB connection to another one? a. CHANGE TO ... b. DISCONNECT ... c. CONNECT TO ... AS ... AUTHORIZATION ... d. SET CONNECTION ...
配分：[20.00]	得分：	1. Which approach checkes the SQL statement at compile time? a. Dynamic SQL. b. Function calls. c. Embedded SQL. d. Call level interface (CLI).
配分：[20.00]	得分：	2. Which function sorts a PHP associative array in descending key order? a. ksort b. krsort() c. sort() d. arsort()
配分：[20.00]	得分：	3. A PHP program is downloaded and executed on the client. a.
配分：[20.00]	得分：	4. What character does a PHP variable start with? a. $ b. _ c. # d. %
配分：[20.00]	得分：	5. What are the advantages of the approach of database stored procedures and functions? a. Enhance the modeling power of views. b. Reduce duplication. c. Enter query at run-time. d. Reduce communication costs.

轉換前



ER diagram

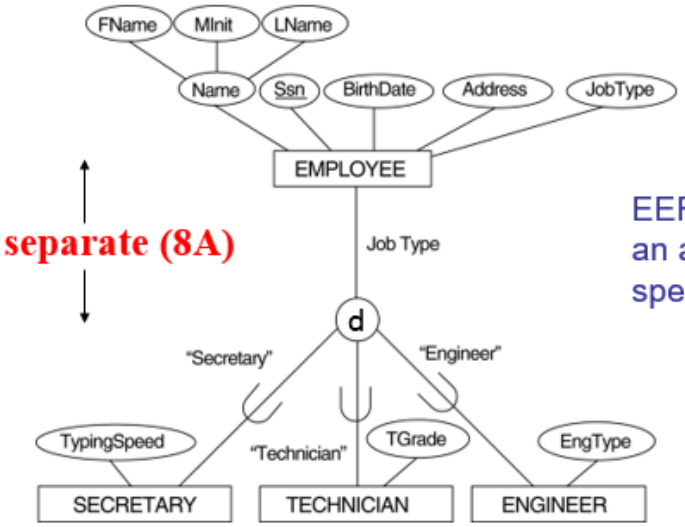
轉換後



Relational Schema
(DB structure)

Options for mapping specialization or generalization.

(a) Mapping the EER schema using option 8A.



separate (8A)

EER diagram notation for an attribute-defined specialization on JobType.

works for any specialization

(a)

EMPLOYEE

SSN	FName	MInit	LName	BirthDate	Address	JobType

SECRETARY

SSN	TypingSpeed

TECHNICIAN

SSN	TGrade

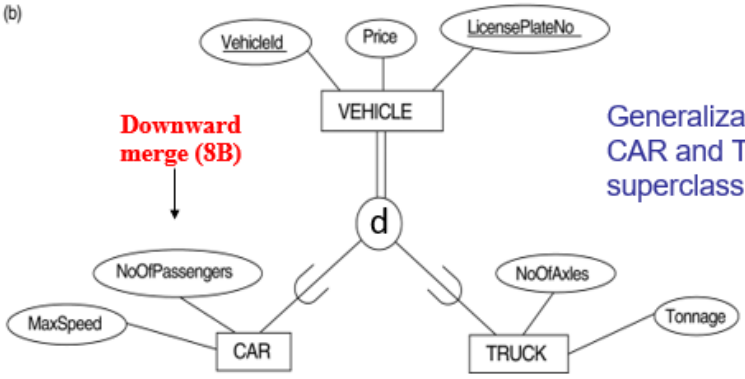
ENGINEER

SSN	EngType

Options for mapping specialization or generalization.

(b) Mapping the EER schema using option 8B.

(b)



Downward merge (8B)

Generalization. (b) Generalizing CAR and TRUCK into the superclass VEHICLE.

Works only for "total" participation

CAR

VehicleId	LicensePlateNo	Price	MaxSpeed	NoOfPassengers

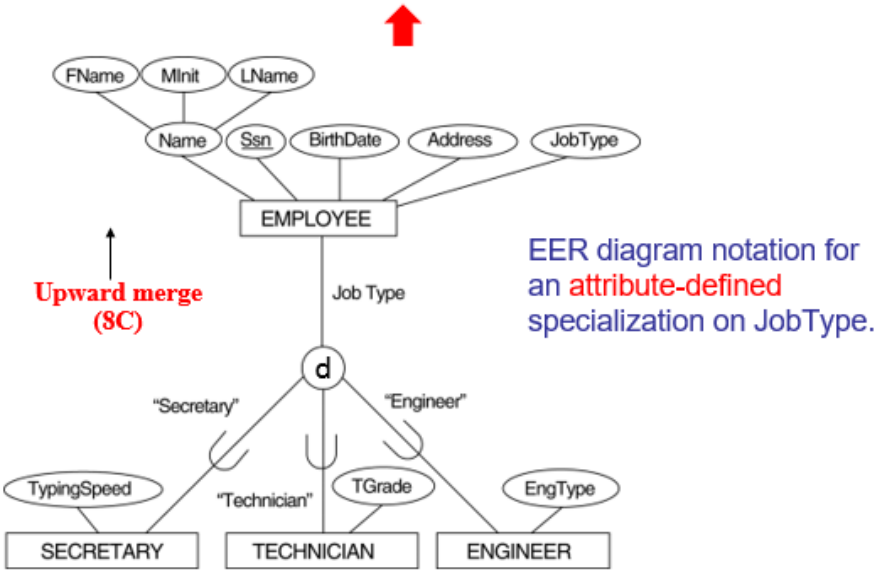
TRUCK

VehicleId	LicensePlateNo	Price	NoOfAxles	**Tonnage**

Options for mapping specialization or generalization.
(c) Mapping the EER schema using option 8C.

(c) EMPLOYEE

SSN	FName	MInit	LName	BirthDate	Address	JobType	TypingSpeed	TGrade	EngType



EER diagram notation for an attribute-defined specialization on JobType.

PERSON

SSN	Name	BirthDate	Sex	Address

EMPLOYEE

SSN	Salary	EmployeeType	Position	Rank	PercentTime	RAFlag	TAFlag	Project	Course

ALUMNUS

SSN

ALUMNUS_DEGREES

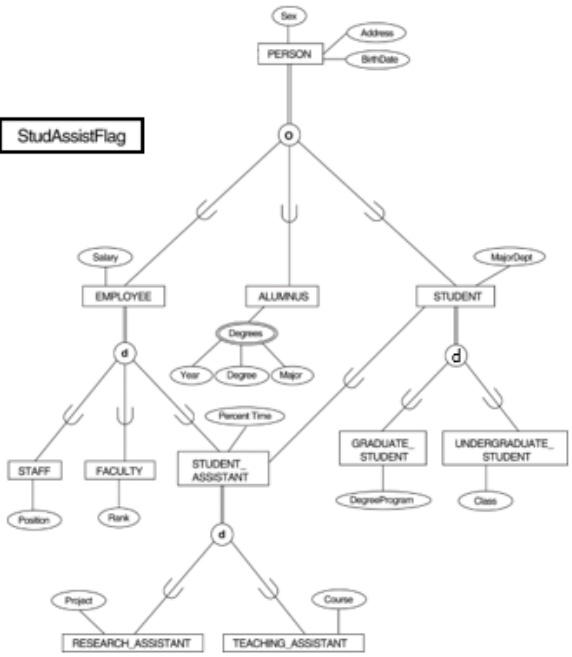
SSN	Year	Degree	Major

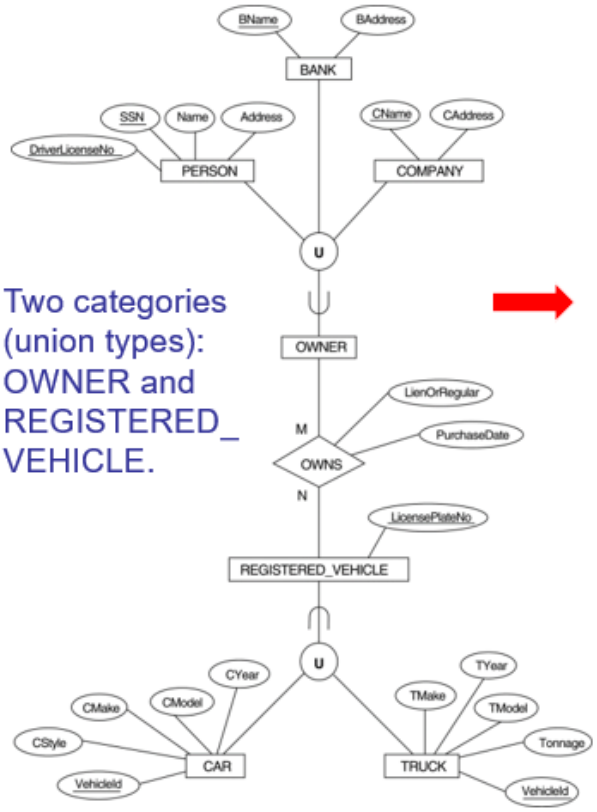
STUDENT

SSN	MajorDept	GradFlag	UndergradFlag	DegreeProgram	Class	StudAssistFlag

Mapping the EER specialization lattice using multiple options.

Shared-subclass:
STUDENT_ASSISTANT





PERSON

SSN	DriverLicenseNo	Name	Address	OwnerId

BANK

BName	BAddress	OwnerId

COMPANY

CName	CAddress	OwnerId

OWNER

OwnerId

<------- surrogate key

REGISTERED_VEHICLE

VehicleId	LicensePlateNumber

CAR

VehicleId	CStyle	CMake	CModel	CYear

TRUCK

VehicleId	TMake	TModel	Tonnage	TYear

OWNS

OwnerId	VehicleId	PurchaseDate	LienOrRegular

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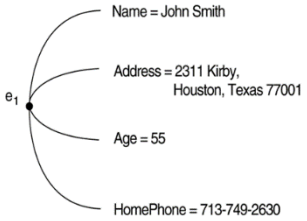
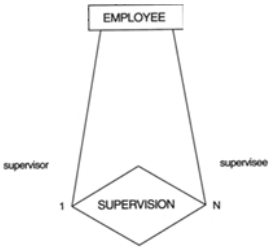
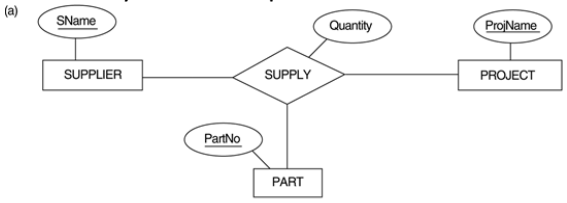
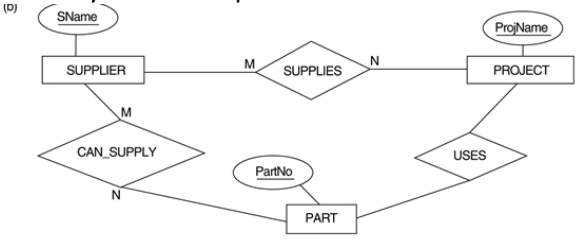
【ER 圖】

 # an n-ary relationship is not equivalent to n binary relationships.

Simple Attribute(只有一個 attribute)	Composite attributes(多個 Composite 組成)
	
Recursive relationship type 遞迴 兩個參與者是相同 Entity、不同 Roles EMPLOYEE(主管)與 EMPLOYEE(下屬) 間的監管關係。	
to n binary relationships 	an n-ary relationship 
(0:1)員工管理 0-1 個部門	(1:1)部門有 1-1 個主管
(0:1)員工管理 0-1 個部門	(1:N)部門有 1-N 個員工
N (對面解讀)一個最多屬一個部門	1 (對面解讀)一個部門有多個員工

/

【EER】

#Please explain the differences between ER model and EER model.

#What additional concepts does the EER model include? (5%)

ER model did't support

特殊化/ 泛化 / 子類別

EER (Enhanced/Extended ER Model)

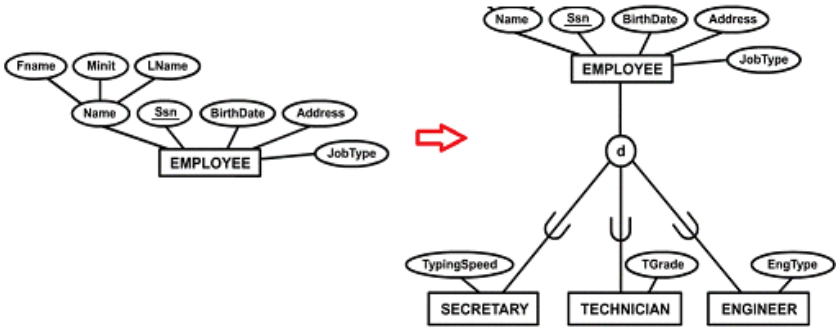
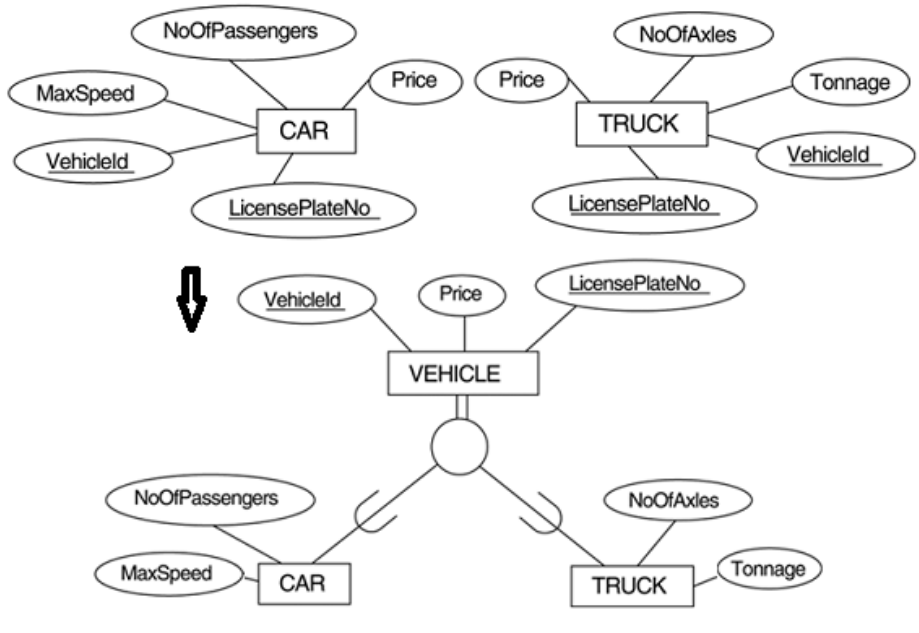
能包括一些物件導向的概念，例如繼承 inheritance

Additional concepts:

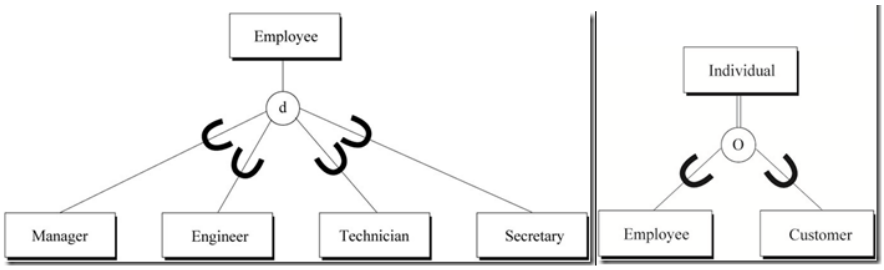
1.subclasses/superclasses, 超/子類別

2.specialization/generalization, 特殊化/泛化

3.categories / inheritance 類別/繼承

特殊化(Specialization)設定數個 Subclass 從 Superclass 中

泛化(Generalization) 似繼承，將共同特徵的 Subclass 聚合成一個 Superclass (U) #Plz generalize the schemas into EER ,with a superclass VEHICLE and two sub CAR, an TRUCK.


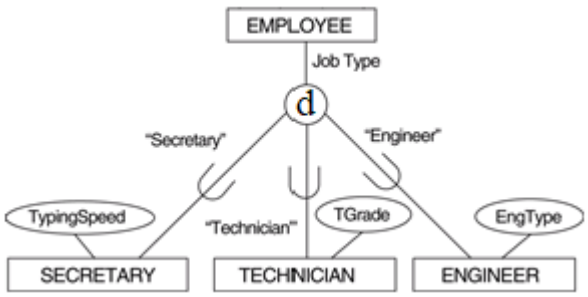
重疊性約束(Disjointness) 「子類會重疊 Overlapping(o)、不重疊 Disjoint(d)」，聚合(a)
完備性約束(Completeness)「子類完全覆蓋 total (||)、不覆蓋 partial (|)」



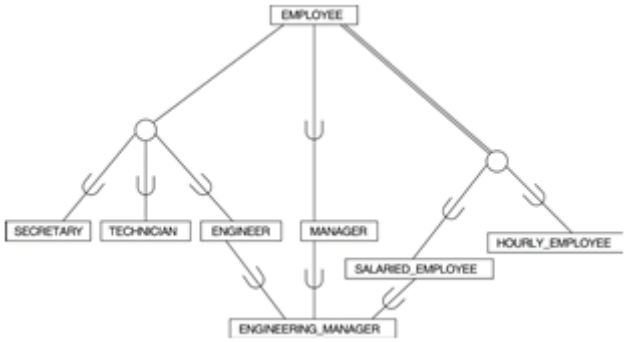
→ Disjoint, partial (d, |)
都是 Employee 子類
且無法覆蓋

→ Overlapping, total (o, ||)
Employee 也可能是 Customer，
Employee 與 Customer 能完全覆蓋 Individual
Generalization usually is total (||)

Hierarchy (單繼承) 每個子類只有一個超類



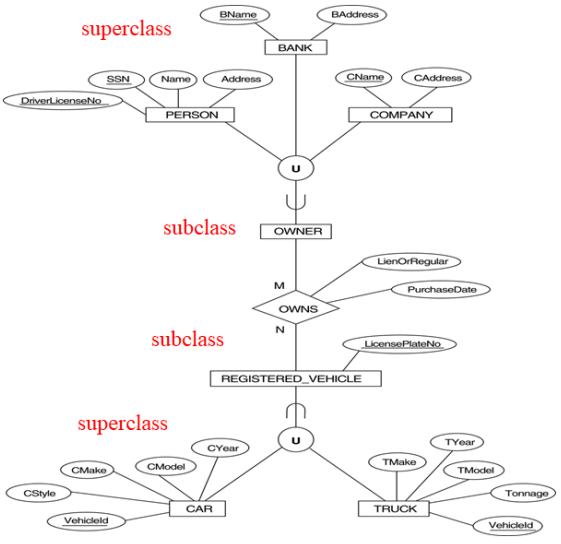
Lattice (多重繼承) 子類可以有多個超類



#Please explain the difference
#between a category and a shared subclass.

- Category(=union type) :
  單個超類、子類關係(relationship)，
  具有多於一個 Superclass
  Ex, OWNER and REGISTERED_VEHICLE.

-Shared class:
  每個關係(relationship)
  都有一個(single)Superclass。



3.Which types of relationship do we need to map the relationship type to a new relation in the relational schema?
An N-ary relationship type.
A binary M:N relationship type

5.To map a multi-valued attribute in an ER diagram to the relational diagram,
we need to create a new relation for the multi-valued attribute.

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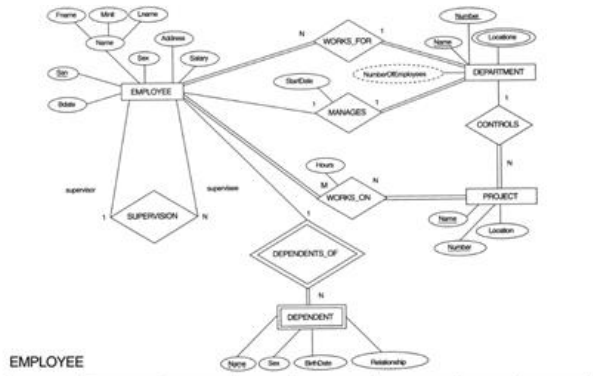
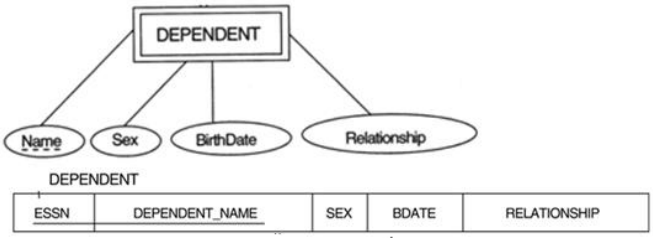
Mapping

ER-to-Relational Mapping Algorithm

Step 1: Mapping of Regular Entity Types



Step 2: Mapping of Weak Entity Types



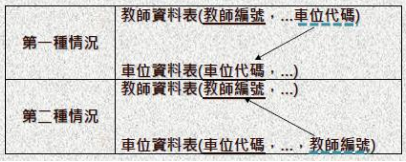
ESSN from owner entity type(s)

Step 3: Mapping of Binary 1:1 Relationship Types

假設每一位「教師」只能分配一個「車位」，並且每一個「車位」僅能被分配給一位「教師」，其一對一的關係之ER圖，如下所示：

請將以上的ER圖轉換成資料表。

【解答】

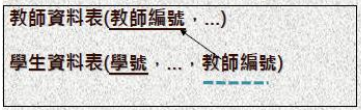


Step 4: Mapping of Binary 1:N Relationship Types.

假設每一位「教師」可以同時指導多位「學生」，但是，每一位「學生」僅能被一位「教師」指導，其一對多的關係之ER圖，如下所示：

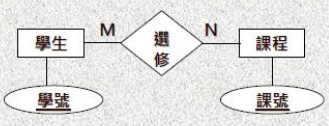
請將以上的ER圖轉換成資料表。

【解答】



Step 5: Mapping of Binary M:N Relationship Types.

假設每一位「學生」可以同時選修多門「課程」，並且，每一門「課程」也可以被多位「學生」來選課，其多對多的關係之ER圖，如下所示：

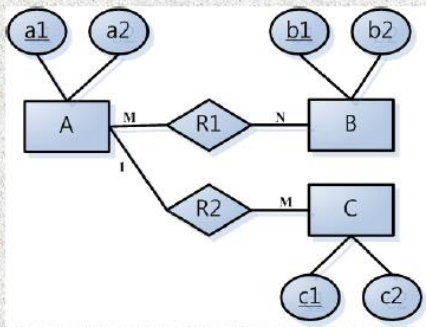


請將以上的ER圖轉換成資料表。

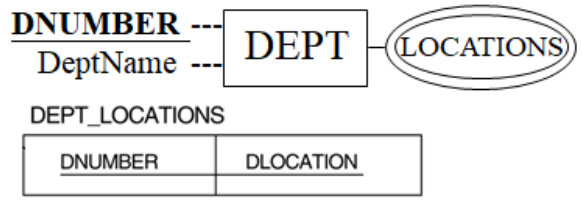
【解答】

exam

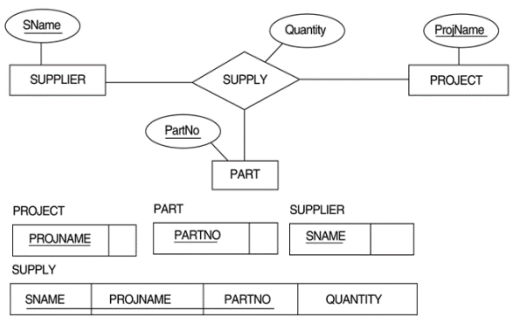
【解答】
A(a1,a2)
B(b1,b2)
C(c1,c2,a1)
R1(a1,b1)



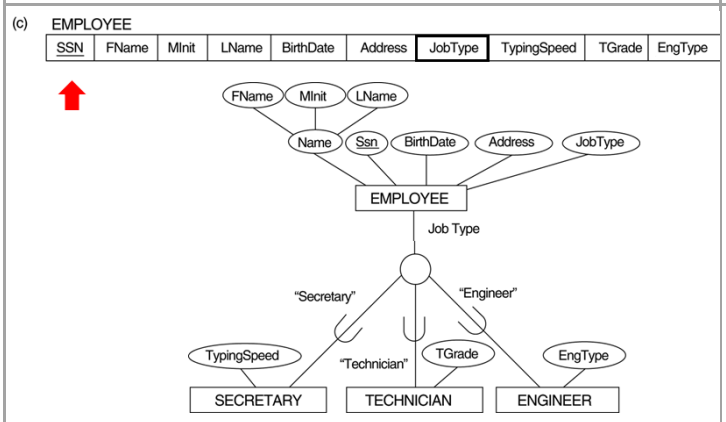
Step 6: Mapping of Multivalued attributes.

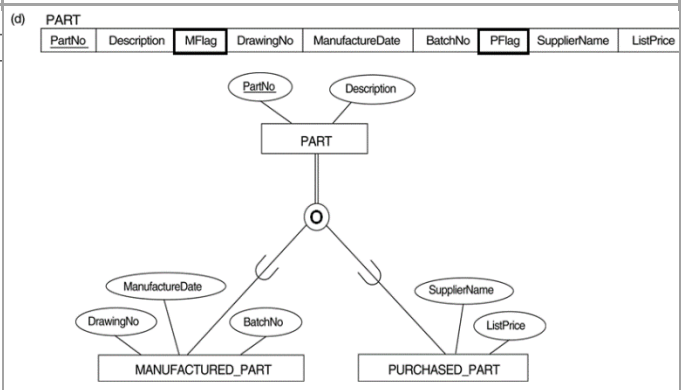


Step 7: Mapping of N-ary Relationship Types.



Mapping EER Model Constructs to Relations	
Step 8: Options for Mapping Specialization or Generalization.	Step 9: Mapping of Union Types (Categories).





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【Impedance Mismatch(阻抗不匹配)】

主機編程語言與 DB 模型之間的不兼容性，例如，

1.Type mismatch & incompatibilities 不匹配&不兼容	• DATE，TIME，TIMESTAMP 等 • 需要為每種語言添加新的綁定(binding)
2.Set-at-a-time vs. record-at-a-time	需要特殊的 Iterators 來遍歷查詢結果並操縱單個值

【Embedded SQL (嵌入式)】

SQL 嵌入在通用編程(general-purpose programming)語言中，例如 C，Java，Pascal

1.Connection	**CONNECT TO** *server-name **AS** *connection-name **AUTHORIZATION** *user-account-info;
2.Change from another	**SET CONNECTION** *connection-name;
3.Disconnection	**DISCONNECT** *connection-name;

shared variables(共享變量) 通常在兩種語言中，SQL 中以冒號（:)為前綴

Program segment E2, a C program segment that uses cursors with embedded SQL for update purposes.

```
//Program Segment E2:
0)  prompt("Enter the Department Name: ", dname) ;
1)  EXEC SQL
2)     select DNUMBER into :dnumber
3)     from DEPARTMENT where DNAME = :dname ;
4)  EXEC SQL DECLARE EMP CURSOR FOR
5)     select SSN, FNAME, MINIT, LNAME, SALARY
6)     from EMPLOYEE where DNO = :dnumber
7)     FOR UPDATE OF SALARY ;
8)  EXEC SQL OPEN EMP ;
9)  EXEC SQL FETCH from EMP into :ssn, :fname, :minit, :lname, :salary ;
10) while (SQLCODE == 0) {
11)    printf("Employee name is:", fname, minit, lname)
12)    prompt("Enter the raise amount: ", raise) ;
13)    EXEC SQL
14)       update EMPLOYEE
15)       set SALARY = SALARY + :raise
16)       where CURRENT OF EMP ;
17)    EXEC SQL FETCH from EMP into :ssn, :fname, :minit, :lname, :salary ;
18)    }
19) EXEC SQL CLOSE EMP ;
```

// declare a cursor EMP
Fetch
Fetch
close

13

Program segment J1:
A JAVA program segment with SQLJ.

```
//Program Segment J1:
1)  ssn = readEntry("Enter a Social Security Number: ") ;
2)  try {
3)     #sql{select FNAME, MINIT, LNAME, ADDRESS, SALARY
4)        into :fname, :minit, :lname, :address, :salary
5)        from EMPLOYEE where SSN = :ssn} ;
6)  } catch (SQLException se) {
7)     System.out.println("Social Security Number does not exist: " + ssn) ;
8)     Return ;
9)     }
10) System.out.println(fname + " " + minit + " " + lname + " " + address + " " +
    salary)
```

Embedded SQL

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【Dynamic SQL (動態式)】

#Dynamic SQL executes new SQL (not previously compiled) statements at run-time.

在運行時執行新的（以前未編譯的）SQL 語句

動態更新相對簡單; 動態查詢可能很複雜

API：使用函數庫進行動態數據庫編程

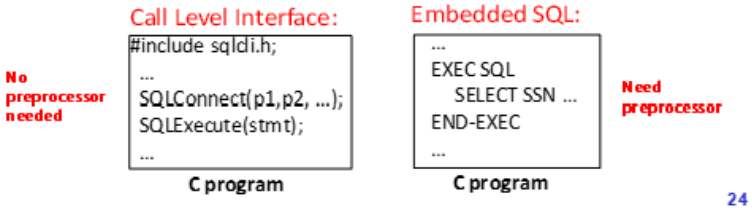
優點：無需預處理器（因此更靈活）

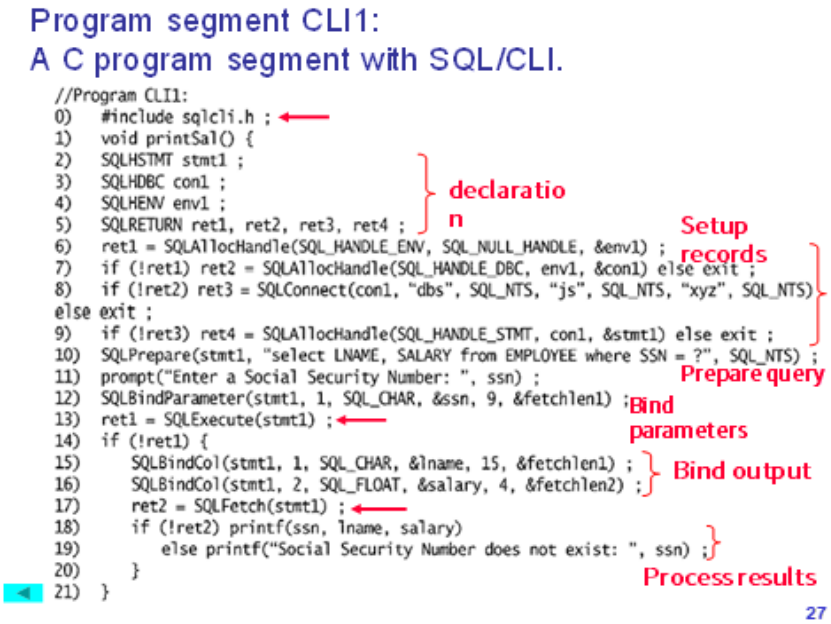
缺點：SQL 語法檢查在運行時完成

【Call Level Interface (呼叫級 CLI)】

可以呼叫 db function 中的函數(library of function)，例如 API

Environment record	紀錄數據庫連接
Connection record	紀錄特定連接所需的信息
Statement record	紀錄 SQL 語句所需的信息
Description record	記錄元組





【Java Database Connectivity (JDBC) 】

SQL connection function calls for Java programming

JDBC 允許程序連接到多個數據庫（稱為數據源）

Program segment JDBC1:
A JAVA program segment with JDBC.

```
//Program JDBC1:
0)   import java.io.* ;
1)   import java.sql.*
     ...
2)   class getEmpInfo {
3)      public static void main (String args []) throws SQLException, IOException {
4)      try { Class.forName("oracle.jdbc.driver.OracleDriver")
5)      } catch (ClassNotFoundException x) {
6)         System.out.println ("Driver could not be loaded") ;
7)         }
8)      String dbacct, passwrd, ssn, lname ;
9)      Double salary ;
10)     dbacct = readentry("Enter database account:") ;
11)     passwrd = readentry("Enter password:") ;
12)     Connection conn = DriverManager.getConnection
13)        ("jdbc:oracle:oci8:" + dbacct + "/" + passwrd) ;
14)     String stmt1 = "select LNAME, SALARY from EMPLOYEE where SSN = ?" ;
15)     PreparedStatement p = conn.prepareStatement(stmt1) ;
16)     ssn = readentry("Enter a Social Security Number: ") ;
17)     p.clearParameters() ;
18)     p.setString(1, ssn) ;
19)     ResultSet r = p.executeQuery() ;
20)     while (r.next()) {
21)        lname = r.getString(1) ;
22)        salary = r.getDouble(2) ;
23)        system.out.println(lname + salary) ;
24)     } }
25)  }
```

declaration
connect
Prepare query
Bind parameter
process query results

31

- "Embedded SQL" approach? (5%)

  SQL 語句嵌入在通用編程語言中，例如 C，Java，Pascal

  (ad)程序更具可讀性。且在編譯時檢查語法(Syntax)錯誤。

  (dis)運行時失去靈活性

- "Library of Function Calls SQL" approach?

  (ad)靈活性

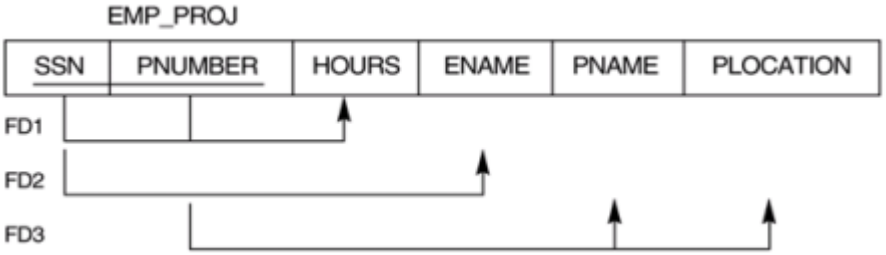
  (dis)複雜：需要檢查運行時錯誤

- "Database Programming Language" SQL approach?

  (ad)沒有阻抗(impedance)不匹配

  (dis)需要學習新的語言

9. The relation EMP_PROJ is not a good relation.
Please explain how this relation will cause (a) insert anomaly and (b) delete anomaly. (10%)



11. Please map the following ER schema to a set of relations. (10%)