习题

上次考试各题型所占分数：

单选题：10分

填空题：10分

简答题：12分

关系代数运算：12分

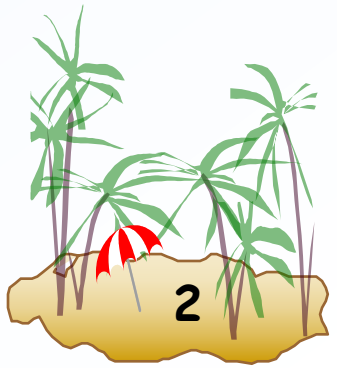
SQL：30分

E-R图与转换：16分

模式分解：10分

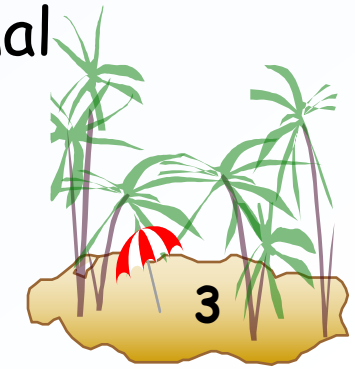
Single Choice

- The database system provides an abstract view of the data, this is achieved through several level of abstraction, among these levels, the (___C___) describes part of the logical structure of the database.
  A. Physical level
  B. Logical level
  C. View level
  D. Application level



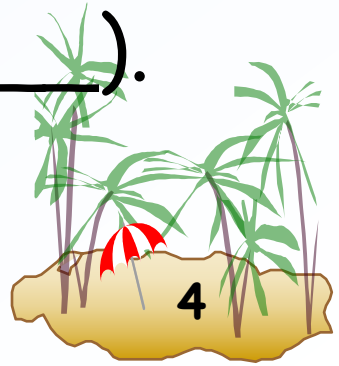
Single Choice

- Witch one of the following is **not** true for schema normalization? (_____C_____)
  A. In relational model, any legal relation schema must satisfies 1NF
  B. For any relation schema, there is always a lossless-join, dependency preserving decomposition into 3NFs
  C. Relations with only 3 attributes are automatically in BCNF
  D. If $\alpha \supseteq \beta$, then $\alpha \rightarrow \beta$ is a trivial functional dependency



Fill In the Following Blanks

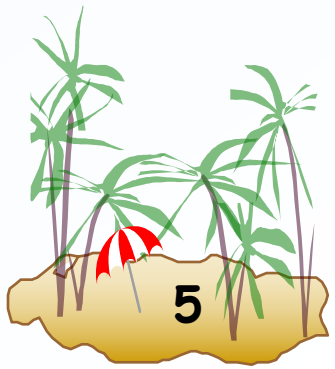
- Database system provides *Data Definition Language(DDL)* to specify database schema, and (__DML_____) to express database queries and updates.
- Collection of operations that form a single logical unit of work in database system are called (_Transaction_____).



Answer The Following Questions

- Briefly describe the difference between *database schema* and *database instance*.

- Briefly describe the difference between *tables* and *views*.



Relational Algebra

R

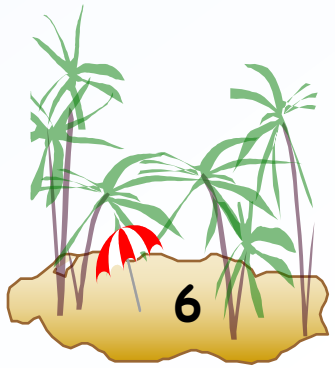
A	B	C
a1	6	7
a2	2	3
a1	2	3
a4	4	5
a2	6	7
a3	7	9

S

B	C
6	7
2	3

$R4 = \Pi_A (R) - (R \div S)$

A
a_3
a_4

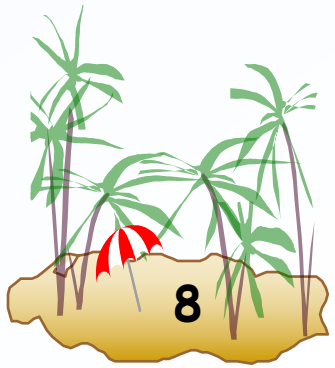


Compose SQL

- Consider the database of a clinic described below (the primary keys are underlined):
  - Patient (PatCode, Name, Age, Sex, Street, City, Occupation)
  - Operation (OperCode, PatCode, DoctCode, OperDate,OperTime, Detail)
  - Doctor (DoctCode, Name, Specialty, Age)
  - Diagnosed_By (PatCode, DoctCode, DiagDate, DiagTime, Prescription)

Compose SQL

1. Define the relation schema *Operation* in SQL (indicates Primary Key and Foreign Key)
2. List all patients diagnosed or operated by doctor “smith”
3. Find all doctors who have diagnosed all patients who’s age are below 12.



1. Define the relation schema *Operation* in SQL

```
Create Table Operation(
OperCode Char(30),
PatCode Char(15),
DocCode Char(15),
DiagDate Date,
DiagTime Time,
Detail VarChar(255),
Primary Key(OperCode),
Foreign Key(PatCode) References  Patient,
Foreign Key(DocCode) References Doctor)
```

2. List all patients diagnosed or operated by doctor “smith”

Using Union

```
(Select Patient.Name
From Doctor, Operation, Patient
Where Doctor.DocCode = Operation.DocCode
        AND Operation.PatCode=Patient.PatCode
        AND Doctor.Name='Smith')
Union
(Select Patient.Name
From Doctor, Diagnosed_by, Patient
Where Doctor.DocCode = Diagnosed_by.DocCode
        AND Diagnosed_by.PatCode=Patient.PatCode
        AND Doctor.Name='Smith')
```

2. List all patients diagnosed or operated by doctor "smith"

Using Subquery

```
Select Patient.Name
From Patient
Where Exists(
        Select *
        From Doctor, Operation
        Where Doctor.DocCode=Operation.DocCode
           AND Doctor.Name='Smith'
           AND Operation.PatCode=Patient.PatCode) OR
        Exists(
        Select *
        From Doctor, Diagnosed_by
        Where Doctor.DocCode=Diagnosed_by.DocCode
         AND Doctor.Name='Smith'
         AND Diagnosed_by.PatCode=Patient.PatCode)
```

3. Find all doctors who have diagnosed all patients who's age are below 12.

Using Subquery

```
Select Doctor.Name
From Doctor D
Where Not Exists(
        Select *
        From Patient P
        Where Age < 12  AND
           Not Exists(
               Select *
               From Diagnosed_by
               Where Diagnosed_by.DocCode=D.DocCode
                     AND Diagnosed_by.PatCode=P.PatCode))
```

3. Find all doctors who have diagnosed all patients who's age are below 12.

Using Set Operations

```
Select Doctor.Name
From Doctor D
Where Not Exists(
      (Select Patient.PatCode
      From Patient
      Where  Patient.Age < 12)
      EXCEPT
      (Select Diagnosed_by.PatCode
       From Diagnosed_by
       Where Diagnosed_by.DocCode=D.DocCode)
   )
```

E-R Model

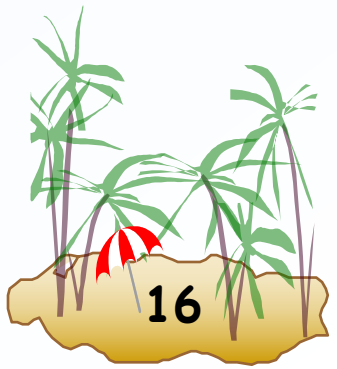
- The Chinese Film Institute collects statistics about movies and moviegoers in china. These statistics is stored in a database.
- This database has the following entity sets
  - ***Movies***, with attributes *movie_id*, *movie_name*, *production_year*, *country*.
  - ***Movie Theaters***, with attributes *theater_id*, *thearter_name*, *city*.
  - ***Screen***, with attributes *screen_id*, *screen_name*. It is a weak entity set, its identifying entity set is *Movie Theaters*, its discriminator is *screen_id*. (movie theater contains one or more screens, where the movies are shown.)

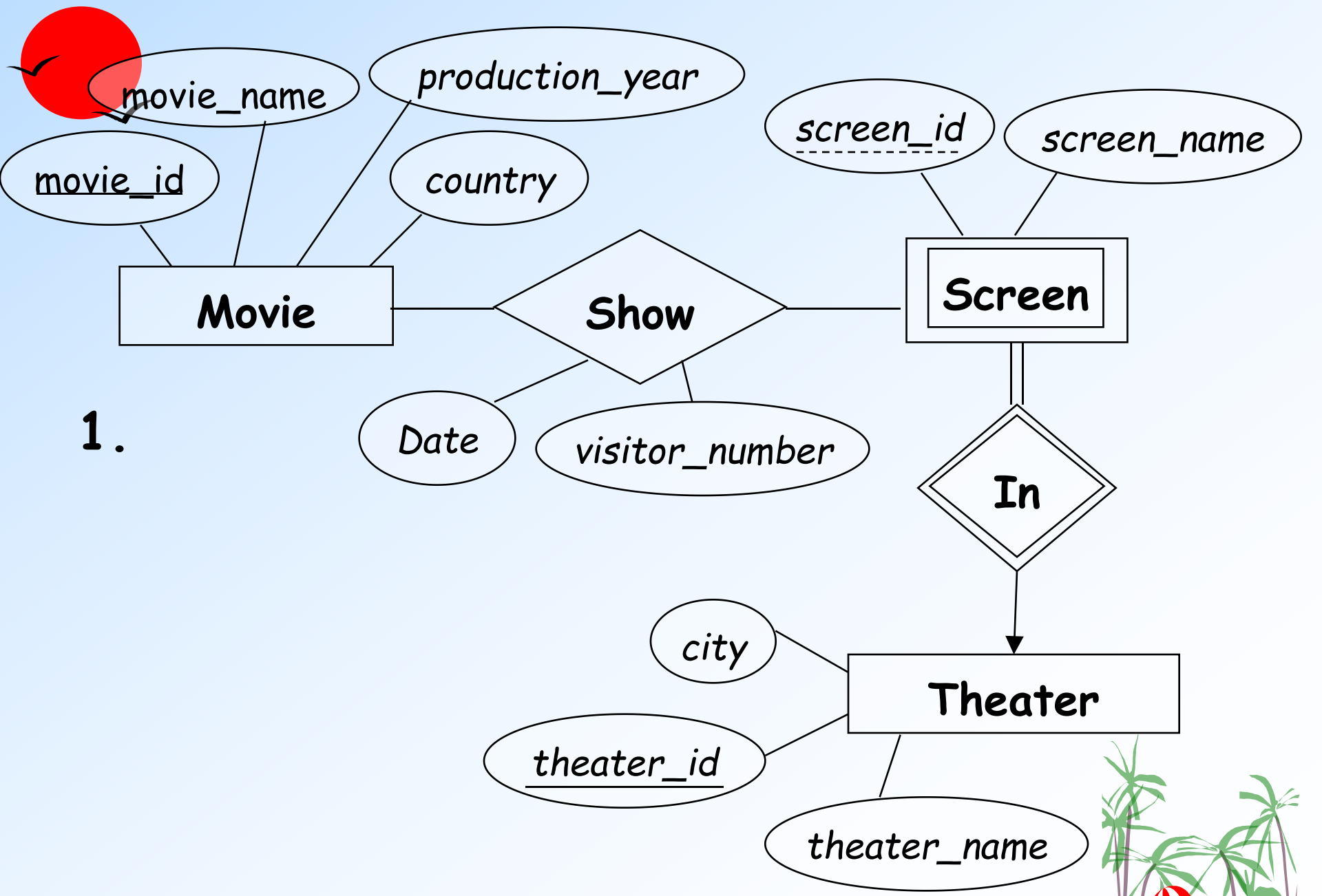
E-R Model

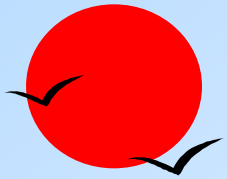
- In addition there are the following relationship sets:
  - **In**, The identifying relationship set between *Screen* and *Movie Theaters*.
  - ***Shows***, The movies are showed on different screens, and we need to store data about the movie shows that have occurred: which movie that was shown, on which screen, at what time, and how many visitors there were.

E-R Model

1. Design an Entity-Relationship diagram with the given entity sets and relationship sets.
2. Translate the E-R diagram into relation schemas.




movie_name
production_year
movie_id
country
screen_id
screen_name
Movie
Show
Screen
1.
Date
visitor_number
In
city
Theater
theater_id
theater_name



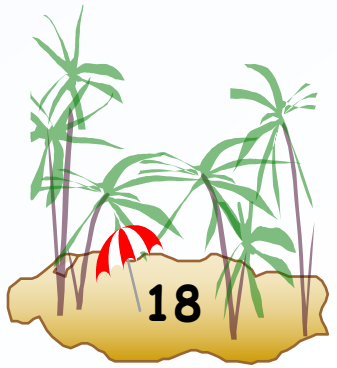
2.

Movie(Movie_id, Movie_name, production_year,country)

Theater(theater_id, theater_name, city)

Screen(theater_id, screen_id, screen_name)

Show(movie_id, theater_id, screen_id, date, visitor_number)



Schema Normalization

Given is the following set of functional dependencies F for a relation schema R:

R={A, B, C, D, E, G} F={E→D, C→B, CE→G, B→A}

Attribute set (C, E) is the only candidate key of R.

1) Decide whether relation schema R is in BCNF. If it is not, describe why

2)Decompose relations R, if necessary, into a collection of relations that are in BCNF. Make sure to indicate which dependency you apply to each decomposition.

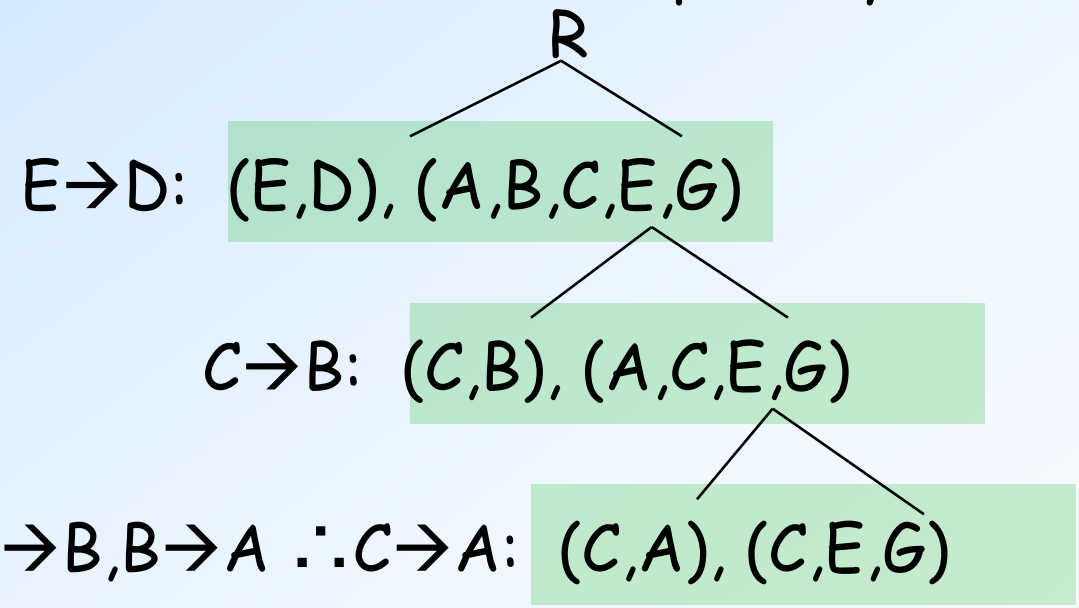
R={A, B, C, D, E, G} F={E→D, C→B, CE→G, B→A}

1. R is Not in BCNF

∵E→D is not a trivial functional dependency,

and E is not a super key

2.



Final Result: (E,D),(C,B),(C,A),(C,E,G)