

上次考试各题型所占分数：

习题



单选题：10分

填空题：10分

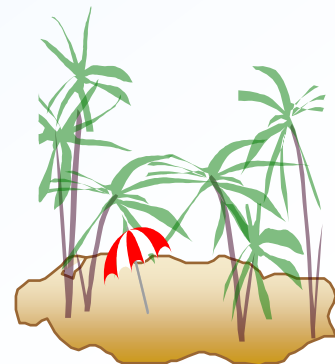
简答题：12分

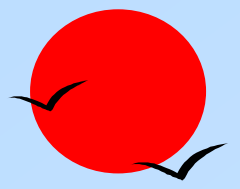
关系代数运算：12分

SQL：30分

E-R图与转换：16分

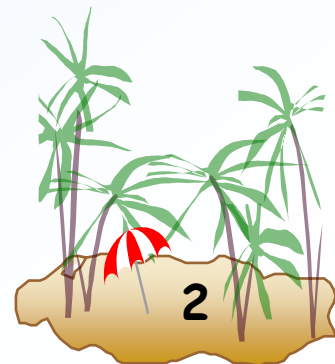
模式分解：10分

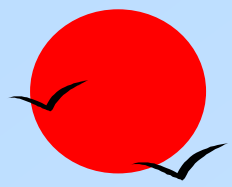




Single Choice

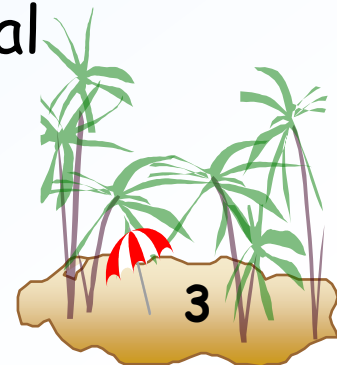
- The database system provides an abstract view of the data, this is achieved through several level of abstraction, among these levels, the (C) describes part of the logical structure of the database.
 - A. Physical level
 - B. Logical level
 - C. View level
 - D. Application level

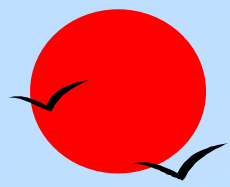




Single Choice

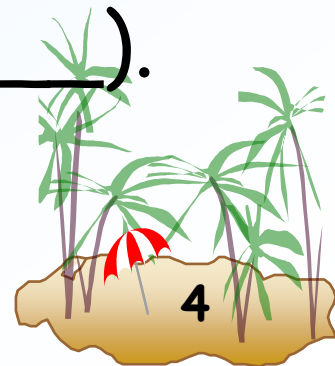
- Which one of the following is **not** true for schema normalization? (_____C_____)
 - A. In relational model, any legal relation schema must satisfies 1NF
 - B. For any relation schema, there is always a lossless-join, dependency preserving decomposition into 3NFs
 - C. Relations with only 3 attributes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

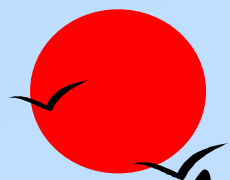




Fill In the Following Blanks

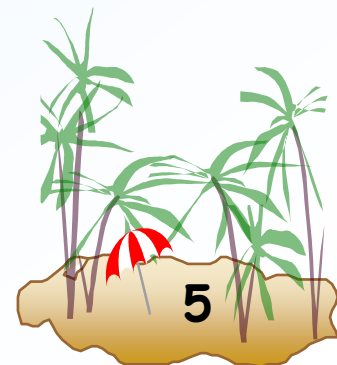
- Database system provides *Data Definition Language(DDL)* to specify database schema, and (DML) to express database queries and updates.
- Collection of operations that form a single logical unit of work in database system are called (Transaction).

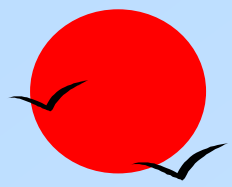




Answer The Following Questions

- Briefly describe the difference between database schema and database instance.
- Briefly describe the difference between tables and views.





Relational Algebra

R

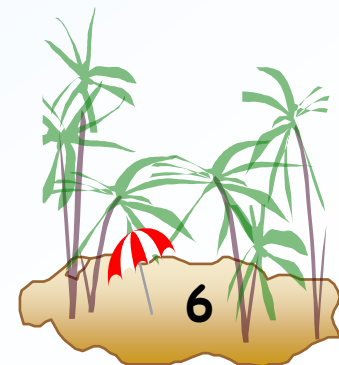
A	B	C
a1	6	7
a2	2	3
a1	2	3
a4	4	5
a2	6	7
a3	7	9

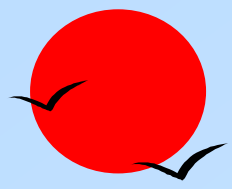
S

B	C
6	7
2	3

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

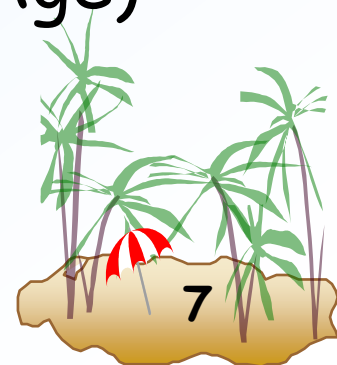
A
a3
a4

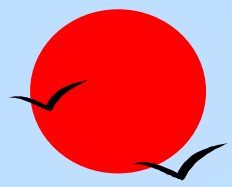




Compose SQL

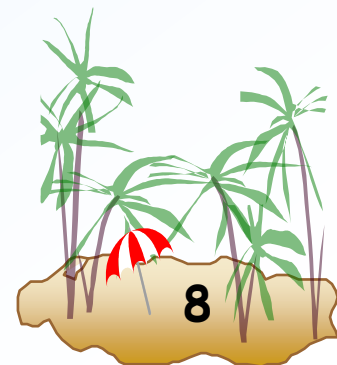
- Consider the database of a clinic described below (the primary keys are underlined):
 - Patient (PatCode, Name, Age, Sex, Street, City, Occupation)
 - Operation (OperCode, PatCode, DoctCode, OperDate, OperTime, Detail)
 - Doctor (DoctCode, Name, Specialty, Age)
 - Diagnosed_By (PatCode, DoctCode, DiagDate,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





Compose SQL

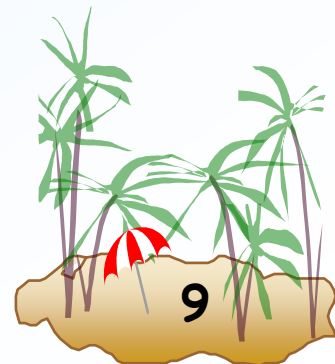
1. Define the relation schema *Operation* in SQL (indicates Primary Key and Foreign Key)
2. List all patients diagnosed or operated by doctor "smith"
3. Find all doctors who have diagnosed all patients who's age are below 12.

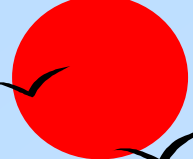




1. Define the relation schema *Operation* in SQL

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

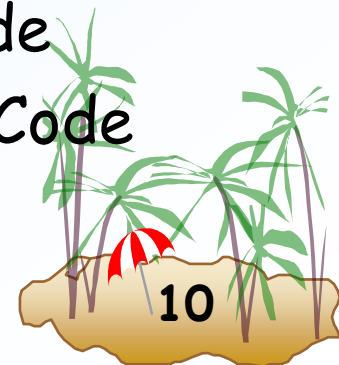
(Select Patient.Name

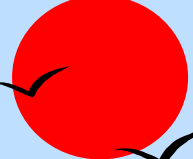
From Doctor, Diagnosed_by, Patient

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(

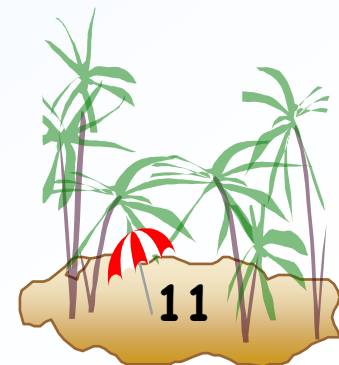
 Select *

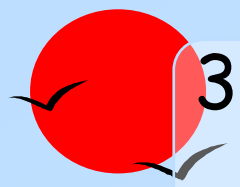
 From Doctor, Diagnosed_by

 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.



Select Doctor.Name

From Doctor D

Where Not Exists(

 Select *

 From Patient P

 Where Age < 12 AND

 Not Exists(

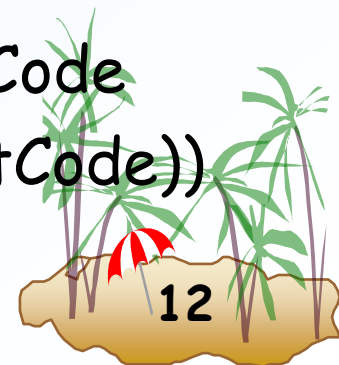
 Select *

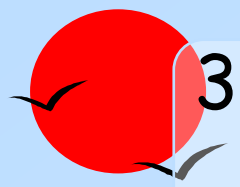
 From Diagnosed_by

 Where Diagnosed_by.DocCode=D.DocCode

 AND Diagnosed_by.PatCode=P.PatCode))

Using Subquery





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



Select Doctor.Name

Using Set Operations

From Doctor D

Where Not Exists(

(Select Patient.PatCode

From Patient

Where Patient.Age < 12)

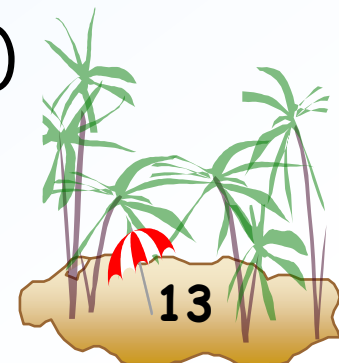
EXCEPT

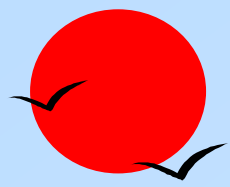
(Select Diagnosed_by.PatCode

From Diagnosed_by

Where Diagnosed_by.DocCode=D.DocCode)

)

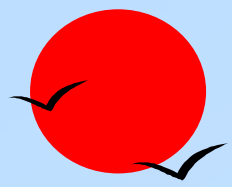




E-R Model

- 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*, *theater_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.)

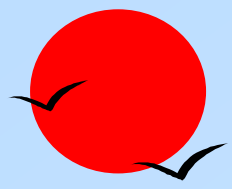




E-R Model

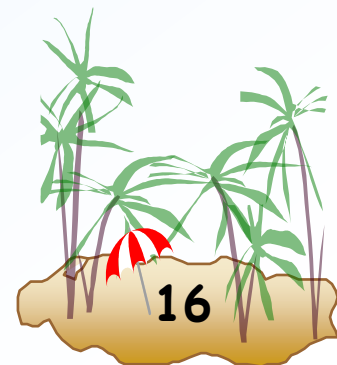
- In addition there are the following relationship sets:
 - In**, The identifying relationship set between *Screen* and *Movie Theaters*.
 - Shows**, The movies are showed on different screens, and we need to store data about the movie shows that have occurred: which movie that was shown, on which screen,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

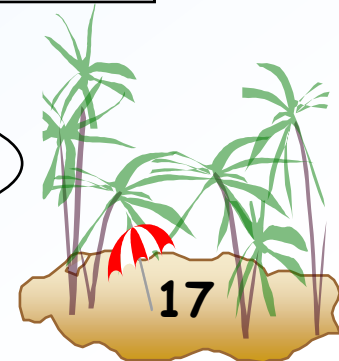
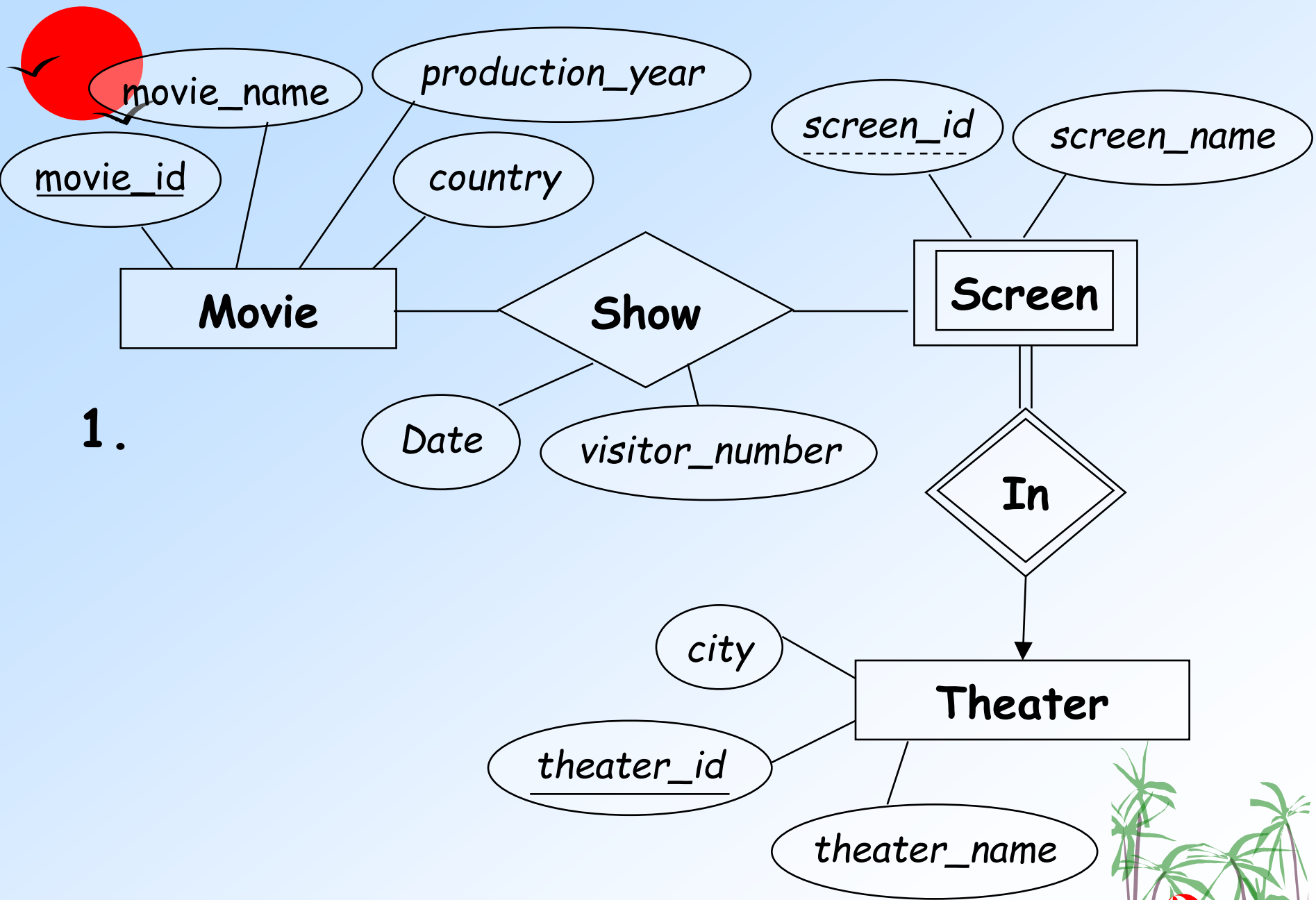


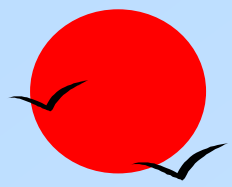


E-R Model

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







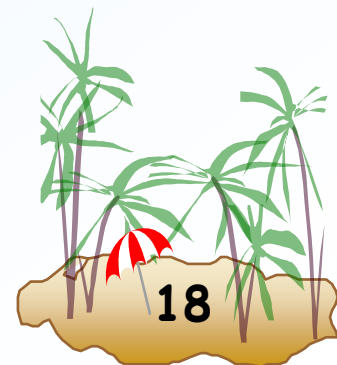
2.

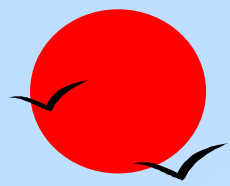
Movie(Movie_id, Movie_name, production_year, country)

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 :

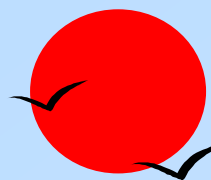
$R = \{A, B, C, D, E, G\}$ $F = \{E \rightarrow D, C \rightarrow B, CE \rightarrow G, B \rightarrow A\}$

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.





$R = \{A, B, C, D, E, G\}$ $F = \{E \rightarrow D, C \rightarrow B, CE \rightarrow G, B \rightarrow A\}$

1. R is Not in BCNF

$\because E \rightarrow D$ is not a trivial functional dependency,

and E is not a super key

2.

R

$E \rightarrow D: (E, D), (A, B, C, E, G)$

$C \rightarrow B: (C, B), (A, C, E, G)$

$C \rightarrow B, B \rightarrow A \therefore C \rightarrow A: (C, A), (C, E, G)$

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

