

1. 目录

1. 目录.....	1
2. Consider the following information in an airport database	2
2.1 Question:	2
2.1.1 Design the E/R diagram	2
2.1.2 Convert the E-R diagram,.....	2
2.2 Answers:	3
2.2.1 (1)	3
2.2.2 (2)	3
3. Consider the following information:	3
3.1 Question:	4
3.1.1 Design and draw an E/R diagram.....	4
3.1.2 convert the E-R diagram to the proper relational schema	4
3.2 Answers:	5
3.2.1 (1) E-R diagram is as follows.....	5
3.2.2 (2) reduced tables are as follows:.....	5
4. Consider the following information	6
4.1 Question:	6
4.1.1 Design the E/R diagram	6
4.1.2 Convert the E-R diagram.....	6
4.2 Answers:.....	7
4.2.1 E-R 图如下	7
4.2.2 转换后的关系表如下	7

2. Consider the following information in an airport database

- An **airport** is described by its **name** and the **city** that the airport locates at
- Each **airplane** has an unique **registration number** and also the **date of production** as its descriptive attributes
- Each **airplane model** is identified by a **model number** and has a **capacity** and a **weight**
- A **technician** is characterized by an unique **technician_id**, his **name** and his **phone number**
- Each **airport** **accommodates** a number of airplane **models**, and an airplane model may appears in several airports; but some airports are not suitable for accommodaing several special plane models.
- Each **airplane** **is of** a specific **model**, e.g. Boeing 737; and for **each model**, there are more than one airplane being of it.
- for each airport, there are some technicians working there, and each technician must works **at only one airport**.
- Each **technician** is **responsible for** one or more plane **models**, and each plane model has at least one technician responsible for it
- Each **airplane** is periodically **tested** by a number of **technicians** to ensure that the airplane is still airworthy. A technician may test several airplanes each year, and sometimes a technician has no task for testing the airplanes.
- **It is required that when a technician tests an airplane, the airplane model that he is responsible for is just the model that the airplane tested is of.**
- The information, such as the **test number, the testing date, the testing result and the time spent on the test**, is needed to describe a testing of the airplane

2.1 Question:

2.1.1 Design the E/R diagram

for the airport database on the basis of the information mentioned above

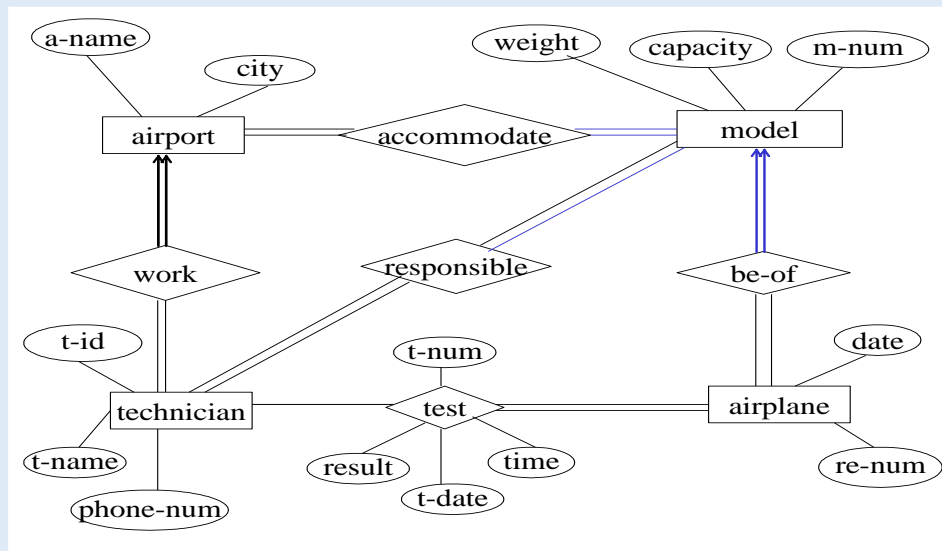
Note: the primary key of the entities, mapping cardinality of each relationship and participation of each entity to the relationship should be described in the diagram.

2.1.2 Convert the E-R diagram,

and give the primary key of each relation schema by underlines.

2.2 Answers:

2.2.1 (1)



2.2.2 (2)

实体 airport 归结为: airport(a-name, city);

实体 model 归结为: model(m-num, weight, capacity);

联系 accommodate 归结为: accommodate (a-name, m-num);

实体 airplane 和联系 be-of 归结为: airplane(re-num, date, **m-num**);

多对一合并: 模式 BE OF(RE-NUM, M-NUM) 模式 AIRPLANE (RE-NUM, DATE)

与 AIRPLANE 合并后的模式属性为 包含两个模式所有属性的并集:

AIRPLANE(RE-NUM, DATE, M-NUM)

合并后的主码为融入关系的那个实体集的主码, 即 RE-NUM

实体 technician、联系 work 归结为:

technician(t-id, t-name, phone-num, a-name) 多对一合并

联系 test 归结为:

test(t-id, re-num, t-num, t-date, time, result)

联系 responsible 归结为: responsible(t-id, m-num)

3. Consider the following information:

A university student database needs to store information about students, professors, projects, and departments.

- Each student has an SNo, a name, an age, and a degree program (e.g. M.S. or Ph.D.).
- Each professor has a PNo, a name, an age, and a research specialty.
- Each project has a project number, a starting date, an ending date, and a budget.
- Each department has a department number, a department name, and a main office.
- integrity constraints:
- A student *studies* in one (and only one) department
- A Professor works in one (and only one) department
- Each project must be managed by one and only one professor, and each professor must manage at least one project.
- Each project is worked on by some students, more than one student can participate(or work on) the same project, and some students may work on no projects.
- When a student work on a project, the professor managing this project must supervise the student's work. One student may work on several projects, so he may have several supervisors.

3.1 Question:

3.1.1 Design and draw an E/R diagram

for this database that captures the information above .

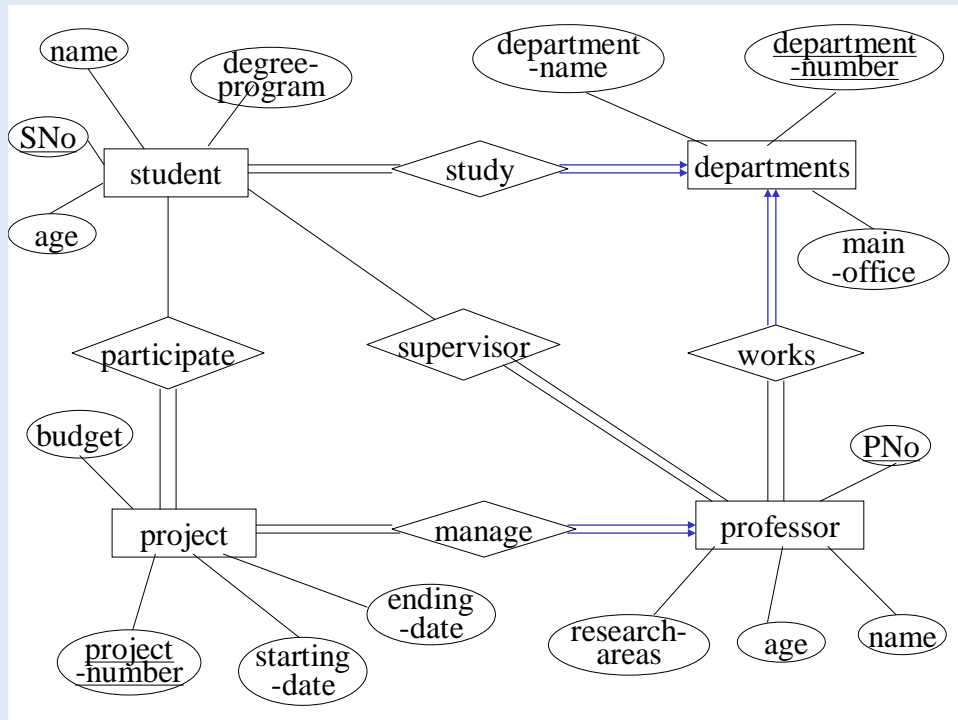
Note: mapping cardinality of each relationship and participation of each entity to the relationship should be described in the diagram.

3.1.2 convert the E-R diagram to the proper relational schema

and give the primary key of each relation schema by underlines.

3.2 Answers:

3.2.1 (1) E-R diagram is as follows



3.2.2 (2) reduced tables are as follows:

(a) student (SNo, name, age, degree-program, *department-number*)

Note: relationship **study** is reduced to this table

原 STUDENT(SNO,AGE,NAME,DEGREE-PROGRAM)

STUDY(SNO,DEPARTMENT-NUMBER)

多对一关系合并后,关系 STUDY 并入 STUDENT,主码为 STUDY 的主码:

STUDENT (SNo, NAME, AGE, DEGREE-PROGRAM, DEPARTMENT-NUMBER)

后续的多对一关系合并类同

(b) professor (PNo, name, age, research-area, *department-number*)

Note: relationship **works** is reduced to this table

(c) department (department-number, depart-name, main-officer)

(d) project(project-number, starting-date, ending-date, budget, *PNo*)

Note: relationship **manage** is reduced to this table

(e) participate (SNo, project-number)

(f) supervisor (SNo, PNo)

4. Consider the following information

A hospital database needs to store information about doctors, patients, sickroom (病房), and departments (科室).

- Each doctor has descriptive attributes of identifier number, name, age, and technical title).
- Each patient has descriptive attributes of the number of medical records(病历) , name, age, and sex
- Each sickroom has descriptive attributes of the number of sickroom, the address
- Each department has descriptive attributes of name, address, telephone-number
- Integrity constraints:
 - a. Each doctor must belong to one (and only one) department; and for each department, there are more than one doctors belonging to it.
 - b. Each patient is taken care of by one and only one responsible doctor; a doctor may be responsible for no patients, or only one patients, or more than one patients
 - c. Each patient lives in one and only one sickroom; a sickroom may contain more than one patients
 - d. Each sickroom can be managed by more than one department; but for some departments, there are no sickrooms managed by them, while for other departments, there are more than one managed sickroom.

4.1 Question:

4.1.1 Design the E/R diagram

for hospital database on basis of the information mentioned above .(10 points)

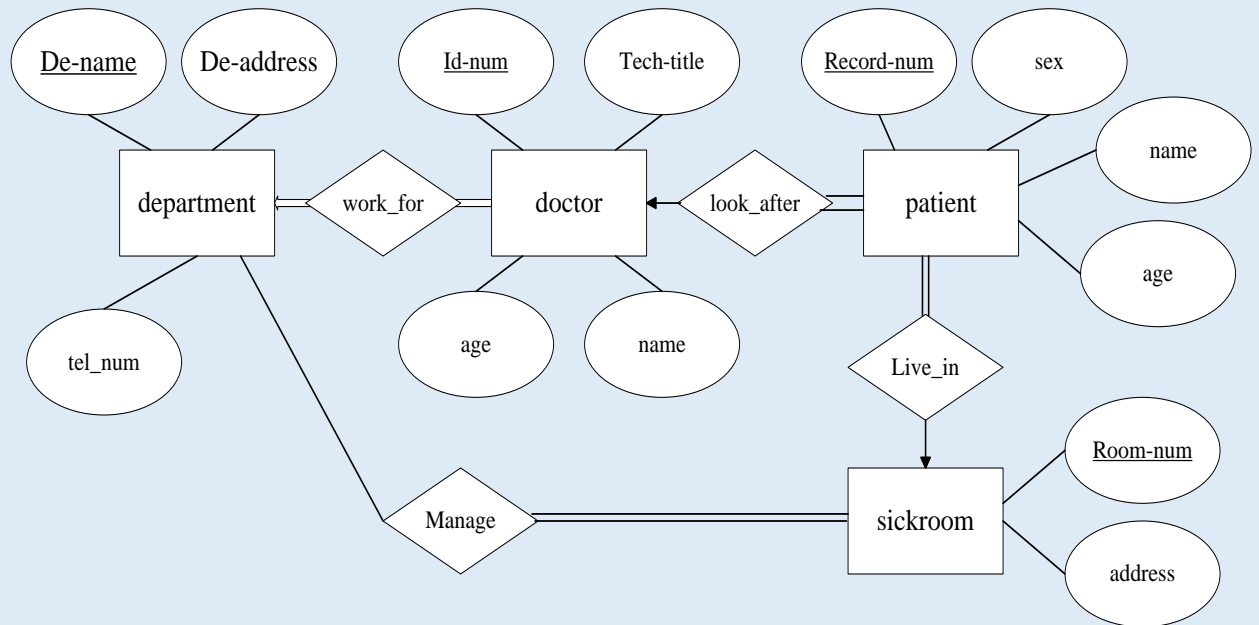
Note: mapping cardinality of each relationship and participation of each entity to the relationship should be described in the diagram.

4.1.2 Convert the E-R diagram

to the proper relational schema, and give the primary key of each relation schema by underlines.

4.2 Answers:

4.2.1 E-R 图如下



4.2.2 转换后的关系表如下

department(de-name, de-address, tel-num)
doctor(id-num, name, age, tech-title, de-name)
patient(record-num, name, sex, age, id-num, room-num)
sickroom(room-num, address)
manage(de-name, room-num)