

employee (ID, person_name, street, city)

works (ID, company_name, salary)

Figure 1

1. (20%) Consider the employee database with two relations in Figure 1.
 - (1) Write a function **avg_salary** that takes a company name as an argument and finds the average salary of employees at that company.
 - (2) Write an SQL statement, using the **avg_salary** function, to find companies whose employees earn a higher average salary than the average salary at “FirstBank”.

(1)

Create function avg_salary(company_name varchar(255))

Return decimal(10,2)

Begin

 Declare avg_salary decimal(10,2);

 Select avg(salary) into avg_salary

 From works

 Where works.company_name=company_name;

 Return avg_salary;

End;

(2)

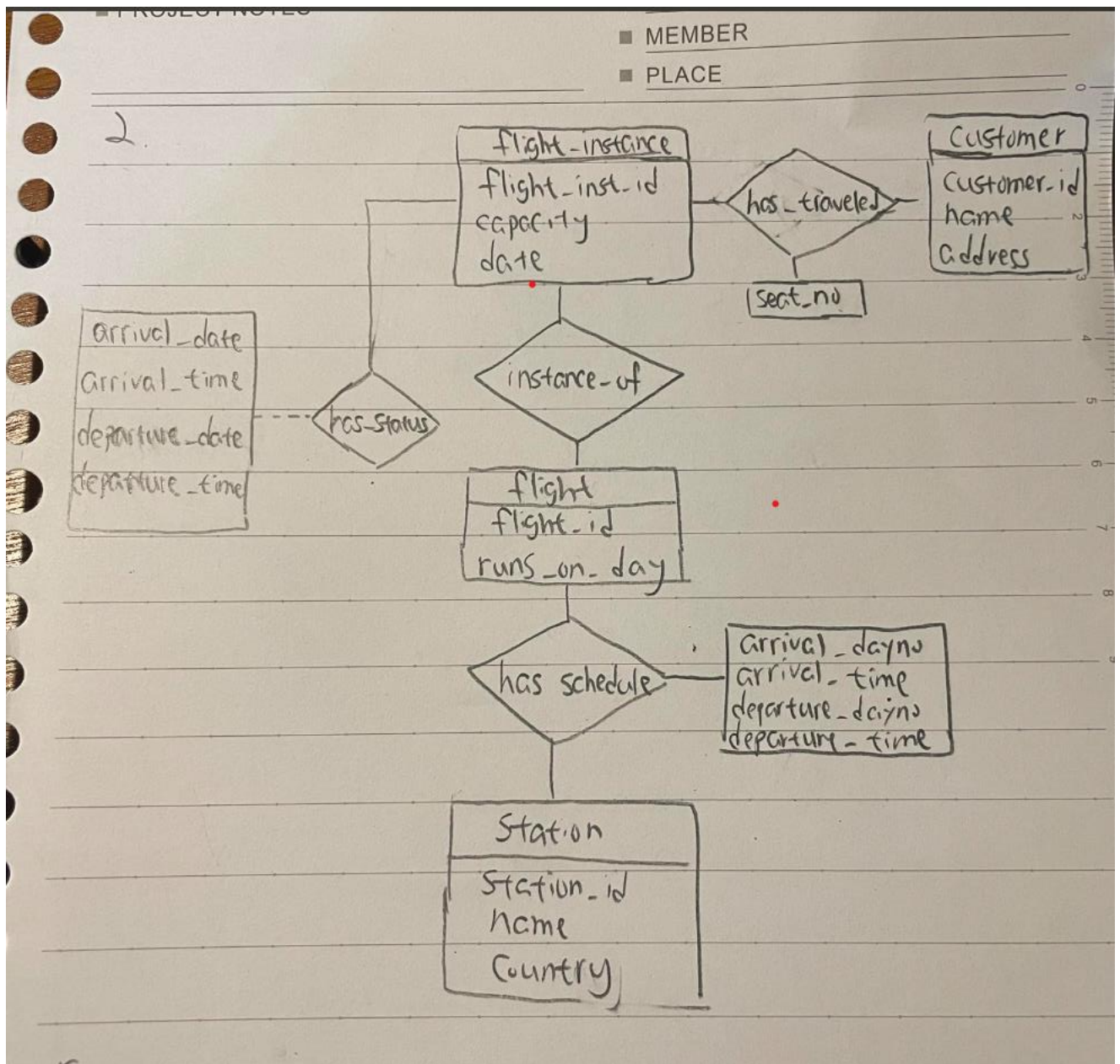
 Select company_name

 Form works

 Group by company_name

 Having avg_salary(company_name)>avg_salary('FirstBank');

2. (20%) Design a database using the ER-diagram for an airline. The database must represent the information of each **flight** (航班), including its flight number and schedules (起飛降落的日期時間). The database also needs to keep track of **customers** and their **reservations** on individual flights, including the status and seat assignments. (Design the proper entity sets and relationship sets. For each entity set, represent the proper primary key and attributes.)



3. (20%) Construct appropriate relational schemas for the E-R diagram in Figure 2. For each relational schema, represent the proper attributes and primary key.

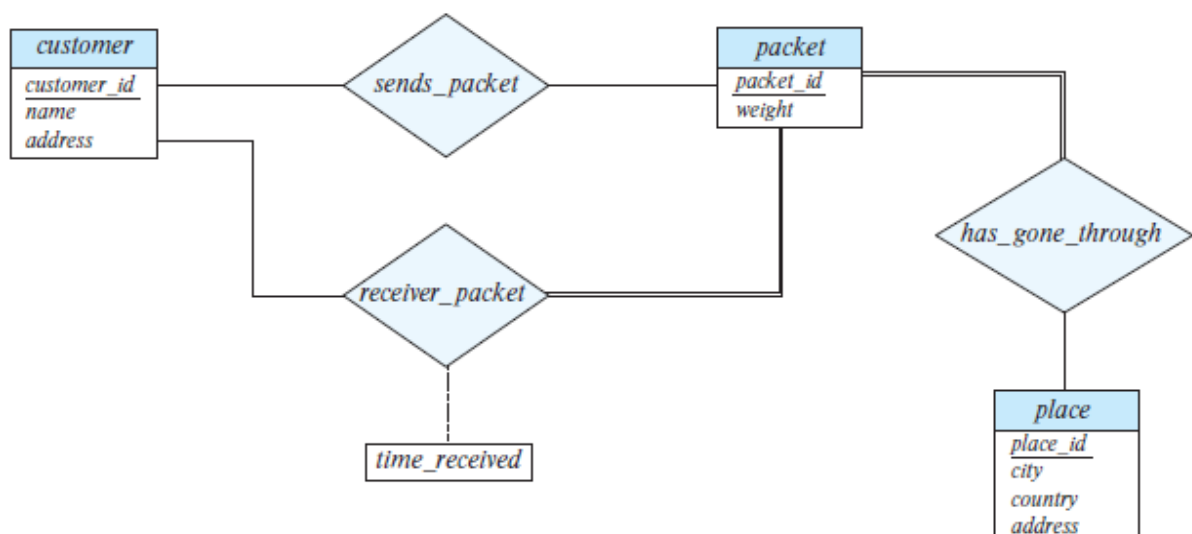
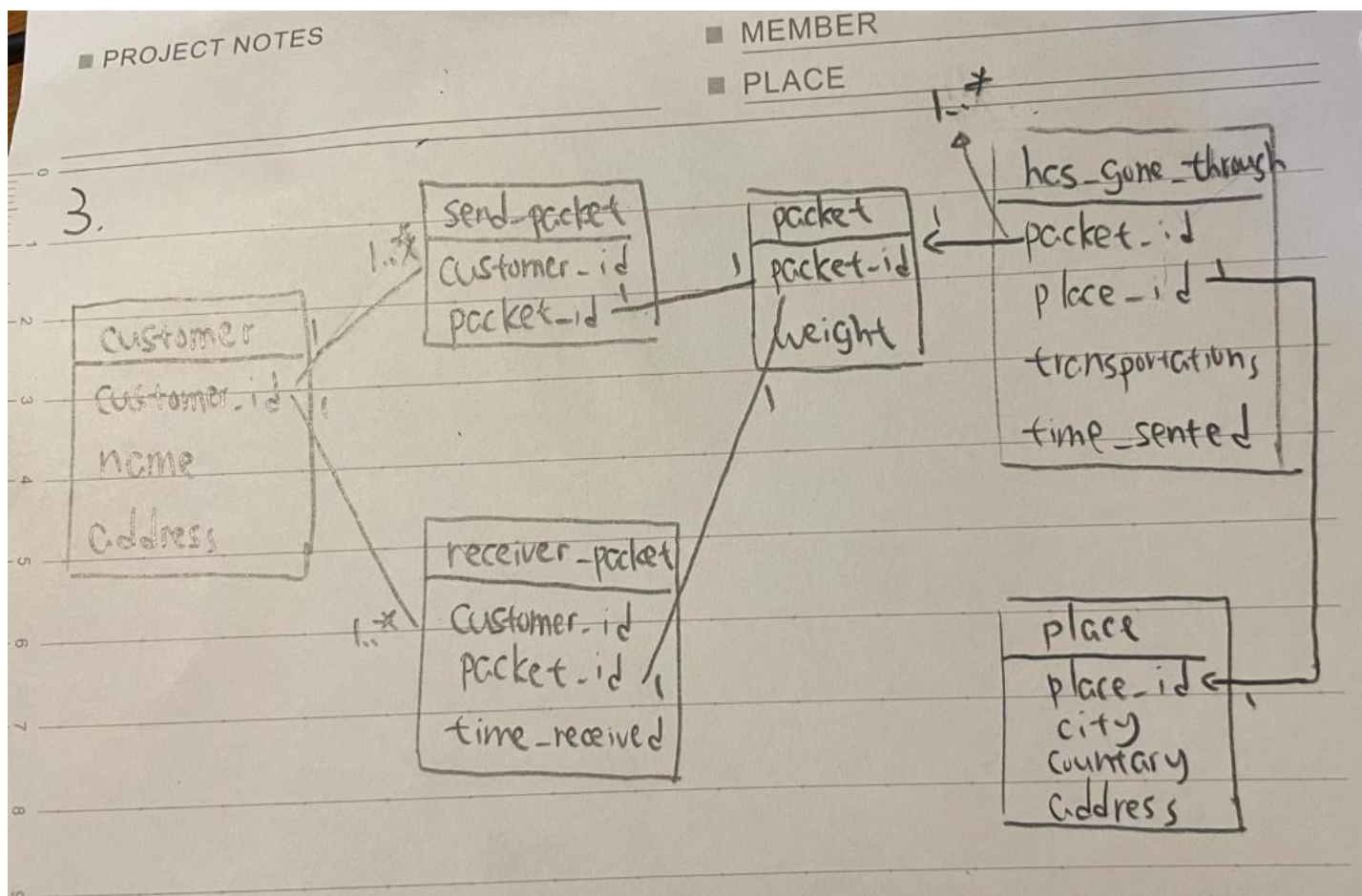


Figure 2



4. (20%) List two nontrivial functional dependencies satisfied by the relation in Figure 3. Explain your answer.

A	B	C
a1	b1	c1
a1	b1	c2
a2	b1	c1
a2	b1	c3

Figure 3

4.

$A \rightarrow B$

$C \rightarrow B$

\Rightarrow logical $AC \rightarrow B$

① C 不能决定 A (当 $C = c_1$ 时, A 是 a_1, a_2)

② A 不能决定 C (当 $A = a_1$ 时, C 是 c_1, c_2)

5. (20%) Consider the schema $R = (A, B, C, D, E, G)$ and the set F of functional dependencies as follows:

$\{AB \rightarrow CD, B \rightarrow D, DE \rightarrow B, DEG \rightarrow AB, AC \rightarrow DE\}$.

(1) Prove that AB is not a superkey.

(2) Prove that DEG is a superkey.

5.

$AB \rightarrow CD \quad B \rightarrow D, \quad DE \rightarrow B, \quad DEG \rightarrow AB \quad AC \rightarrow DE$

(1) $AB^+ = AB$
因為 $AB \rightarrow CD$
 $\Rightarrow AB^+ = ABCD$
 AB 沒有包含所有屬性 (E, G)
所以不是 superkey

(2) $DEG^+ = DEG$
因為 $DEG \rightarrow AB$
 $\Rightarrow DEG^+ = ABDEG$
因為 $AB \rightarrow CD$
 $\Rightarrow DEG^+ = ABCDEG$
 DEG 有包含所有屬性
 \Rightarrow 所以是 superkey

(3)

Note: Please submit your homework in a single PDF file to TronClass by 12/20/2023 11:59pm.