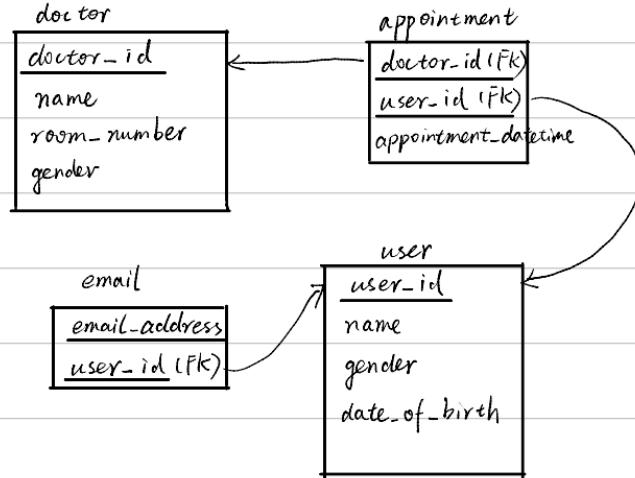


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Q1.



Q2. ① check $A \rightarrow C$, $A^+ = (ACE)$,

A is not superkey, so R relation is not BCNF

② $CD \rightarrow B$, $CD \rightarrow A$ is redundancy, since $A \rightarrow C$, $B \rightarrow D \Rightarrow AB \rightarrow CD \rightarrow A$, B

$CD \rightarrow E$ is redundant, since $AB \rightarrow CD \rightarrow A \rightarrow E \Rightarrow CD \rightarrow E$.

so consider functional dependencies $f = \{A \rightarrow C, A \rightarrow E, B \rightarrow D\}$
 $f = f_C$.

decompose : result = $\{R\}$

1. R is not in BCNF

$A \rightarrow C$ is nontrivial

$A \rightarrow R$ & f^+ and $A \cap C = \emptyset$

result = $\{ABDE, AC\}$

2. $R_1 = ABDE$ is not in BCNF,

since $A^+ = (AE) \neq (ABDE)$.

$A \rightarrow E$ is nontrivial

$A \rightarrow R$ & f^+ and $A \cap E = \emptyset$

result = $\{ABD, AE, AC\}$

3. $R_2 = ABD$ is not in BCNF

日期: / since $B^+ = \{BD\} \neq R_2$,

consider $B \rightarrow D$, $B \rightarrow (ABD)$ not holds, $B \wedge D = \emptyset$

result = {AB, BD, AE, AC}

BCNF decomposition = {AB, BD, AE, AC}

Q3. 4(a)

Π staff.names, staff.city, (G branchname = 'B1' and (WORKIN \bowtie STAFF))
salary > 26000

Select s. StaffName, s.city, w.salary

from STAFF s

inner join

(Select * from WORKIN where BranchName = 'B1' and salary > 26000)
on s. StaffID = w. StaffID;

4. (b) Π staff.names, staff.city, salary (G branchname = 'B1' and (STAFF \times WORKIN))
salary > 26000 and
staff.staffID = workin.staffID

Select s. StaffName, s.city, w.salary

from STAFF s, WORKIN w

where s.staffID = w.staffID and w.salary > 26000 and w.branchname = 'B1'

4. (c) Π staffnames, branch.street, branch.city (G staff.city = branch.city,
staff.staffID = workin.staffID,
branch.branchname = workin.branchname
(STAFF \times BRANCH \times WORKIN))

Select s.staffnames, b.street, b.city from STAFF s, BRANCH b, WORKIN w
where s.staffID = w.staffID, b.Branchname = w.branchname, s.city = b.city;

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4. (d)

$\Pi_{\text{staffname}, \text{workin.salary}} (\text{branchname} = 'B1' \text{ and } (\text{STAFF} \bowtie \text{WORKIN}) \text{ and } \text{salary} > \text{AVG}(\text{salary})(\text{WORKIN}))$

```
select s.staffname, w.salary
from WORKIN w
inner join STAFF s
on w.staffID = s.staffID
where w.branchname = 'B1' and w.salary >
(select avg(salary) from WORKIN);
```

4. (e) MID $\leftarrow \Pi_{\text{staffID}} G_{\text{staffID} = \text{ManagerID}} (\text{WORKIN} \times \text{MANAGE})$

NMID $\leftarrow \Pi_{\text{staffID}} (\text{WORKIN}) - \text{MID}$

$\Pi_{\text{staffname, branch name}} (\text{STAFF} \bowtie \text{WORKIN} \bowtie \text{NMID})$

```
set view NMID as
select staffID
from WORKIN
minus
select w.staffID
from WORKIN w, MANAGE m
where w.staffID = m.managerID;
```

```
select s.staffname, w.branchname
from STAFF s
inner join WORKIN w
on s.staffID = w.staffID
inner join NMID n
on s.staffID = n.staffID;
```

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4. (f) $\text{SUB-CITY} \leftarrow \prod_{\text{Member ID}, \text{Manager ID}, \text{city}} \text{Member ID}, \text{Manager ID}, \text{city} \quad \text{6 Member ID} = \text{staff ID}$ ($\text{STAFF} \times \text{MANAGE}$)

$\text{SUP-CITY} \leftarrow \prod_{\text{Member ID}, \text{Manager ID}, \text{city}} \text{Member ID}, \text{Manager ID}, \text{city} \quad \text{6 Manager ID} = \text{staff ID}$ ($\text{STAFF} \times \text{MANAGE}$)

$\text{SUB-CITY} \cap \text{SUP-CITY}$

select m. Member ID, m. Manager ID, s. city

from MANAGE m

inner join STAFF s

on m. Member ID = s. STAFF ID

intersect

select m. Member ID, m. Manager ID, s. city

from MANAGE m

inner join STAFF s

on m. Manager ID = s. STAFF ID;