Lecture 11, MCQ + MCQ(1)

(L11)

1. a, ~~b~~, d.

ORDER BY evaluated after the GROUP BY

2. b

Natural join of R_1 and R_2 contains all attributes from both relations, excluding duplicate columns.

3. c Multiple External Structures

The ANSI-SPARC architecture is a 3 level architecture for a database system

- conceptual structure : the db schema
- external structures : data structures
- physical structure : storage

4. 1NF, ~~2NF~~ $\Rightarrow$ not 2NF $\Rightarrow$ C.

Same Data, Different Views for different Users.

5. e.

6. a

7. C.

8.

Q_1: 1 null, 1 null, 1 null $\Big\}$ $3 + 2 \cdot 3 = 3 + 6 = 9$

Q_2: $2 \cdot 3 = 6 \Rightarrow 9 - 6 = \boxed{3}$

---

9. a

10. $|Q_1| = 0$, $|Q_2| = 0 \Rightarrow \boxed{0}$

11. b, c.

12.

	A	B
1	a_1	b_2
2	a_1	b_1
2	a_2	b_1

B	C
b_2	c_1
b_1	c_2
b_1	c_1

A	C
a_1	c_1
a_1	c_2
a_2	c_1

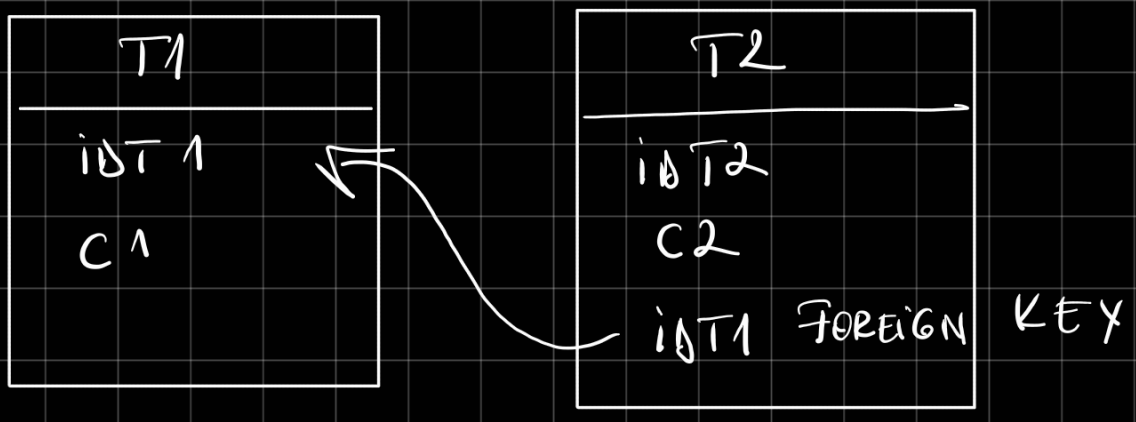
c_2 not in

$4 - 3 = 1$

AC

13. a, d

II.

① 

②

$$\pi_{\{A,B,C\}}((\pi_{\{A,B,ID\}}(\sigma_{M=70}(R))) \otimes_{ID=IDT1} (\pi_{\{C,IDT1\}}(\sigma_{N>5}(S))))$$

```
SELECT A,B,C
FROM ( SELECT A, B, ID
       FROM R
       WHERE M = 70 ) AS R1
       INNER JOIN
       (SELECT C, IDT1
        FROM S
        where N>5) AS R1
```

OR $R.B = S.B$)

(3.)

Rid	C2	C3
6	600	90000
2	202	1012

ANY ⇒ MIN

4	400	40000
5	400	40000

---

(4) $T = 4 * 6 = \boxed{24.}$

(5.) ⇒ 200, 9 ⟶ 2 results

RID	A	B	C	D	E	F
1	100	200	5	200	20	11
2	101	50	11	200	5	12
3	100	100	7	200	5	13
4	200	200	6	200	20	14
5	200	100	2	200	5	9
6	300	50	11	200	5	10

⇒ The whole R.

Rid → A

(6.) A → D, B → D, C → D, E → D, F → D

(7.) $\left(\sigma_{Rid=SRid}(R \times S)\right) = \left(\sigma_{\cdot}^{(R \times S)} \sigma_{\cdot}^{(T \times U)}\right)$

MCQ:

1. e
2. d
3. c, d
4. a, c
5. b.

The conceptual evaluation strategy in a SELECT query is:
FROM, WHERE, GROUPBY, HAVING, SELECT, ORDER BY.

6. c
7. b
8. b.
9. a, b, c
10. a ?
11. NULL OR NULL ⇒ NULL

c.

MCQ (2)

1. a, b, d

2. $2*2 + 1*1 + 2*2 = 4+1+4 = \boxed{9}$ d

3. e.

4. b

5. a, c

6. b

7. e

Natural Join automatically joins tables based on the columns with the same name and data types.

Returns all columns from both tables with matching columns removed.

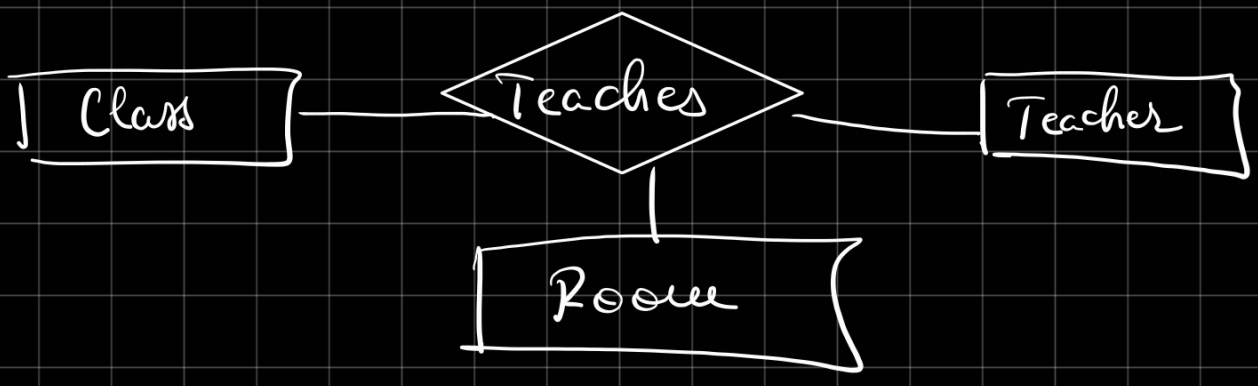
8. Not in 2 NF $\Rightarrow$ $\boxed{1NF}$ a)

9. b, c, d

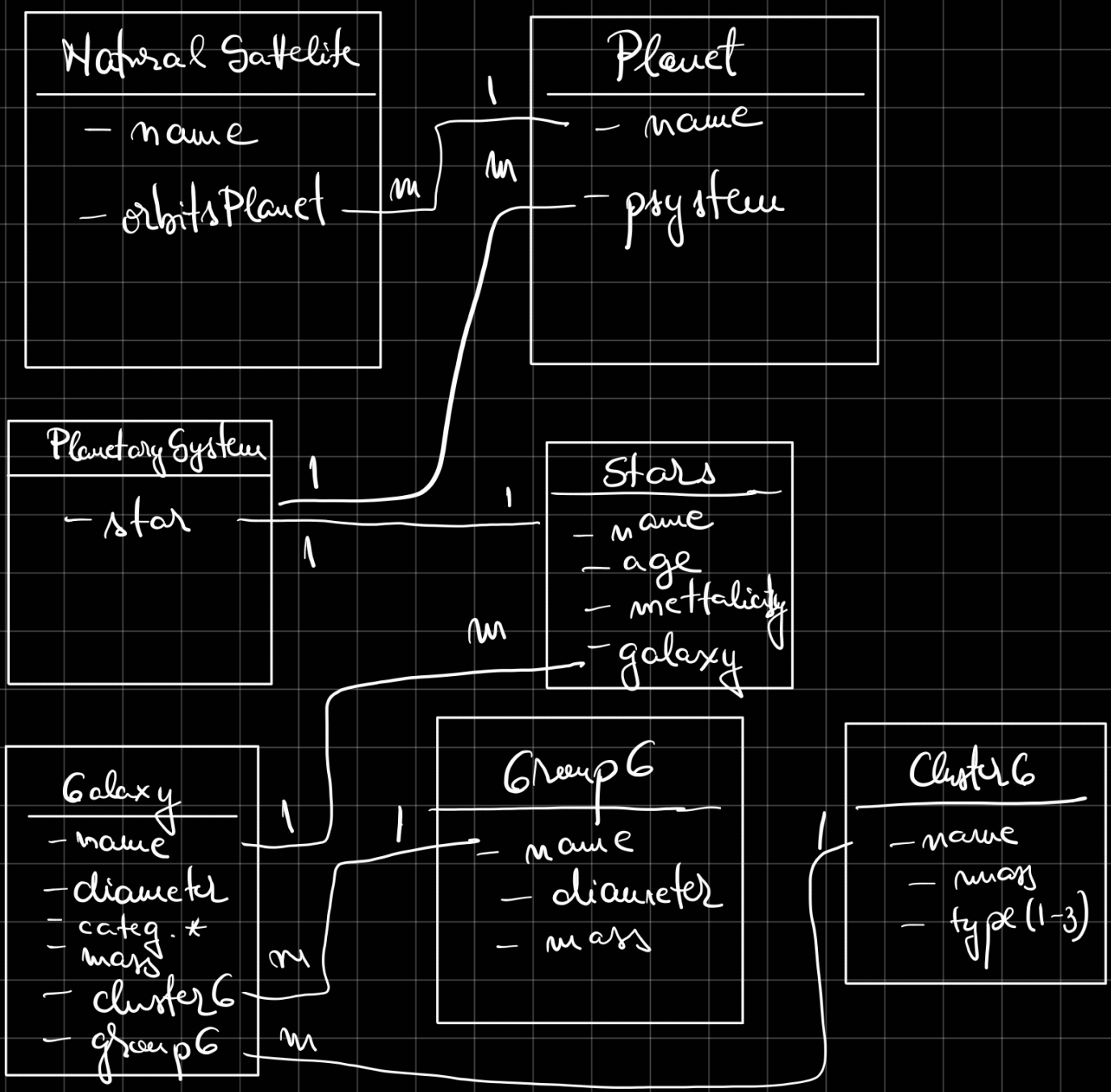
Exam Subjects 2020

I. 1. The 3rd normal form represents a state of relation R where R is in 2nd normal form and all non-prime attributes depend on the key, the whole key and nothing but the key.

2. Ternary relationship set = 3 entities



II.



b) CREATE TABLE NaturalSatellite

(name VARCHAR(255) PRIMARY KEY,

```
    orbitsPlanet VARCHAR(255) FOREIGN KEY
        REFERENCES Planets(name)
)
```

2.
```
SELECT s.Name, s.Age
FROM Stars s
WHERE s.Galaxy = 'Milky Way' AND
    ( 5 >= ( SELECT COUNT(*)
             FROM Planets p
             WHERE p.PSystem = s.Name)
    OR 1 >= ( SELECT COUNT(*)
              FROM NaturalSatellites n
              INNER JOIN Planets pp
              ON n.orbitsPlanet = pp.Name
              WHERE pp.PSystem = s.Name)
    )
```

---

b.

$$\pi_{c.name,\, g.name}\left(\sigma_{c.type=2}\left(\text{Galaxy} \otimes_{cluster6 = name} \text{ClusterG}\right)\right)$$

π	1	a, b, d	5 a, c

Data Description

2. d

3. e

4. b

6. a, c, d

7. b

8. e

9. a

- Description model describes:
  - structure of data
  - consistency constraints
  - relationship with other data.

10. b, c, d

11. c, d?

Dense Indexes ⇒ entries for every key in the dataset

Sparse Indexes ⇒
- entries for portion of keys
- key - pointer pairs.
- reduced size of index.

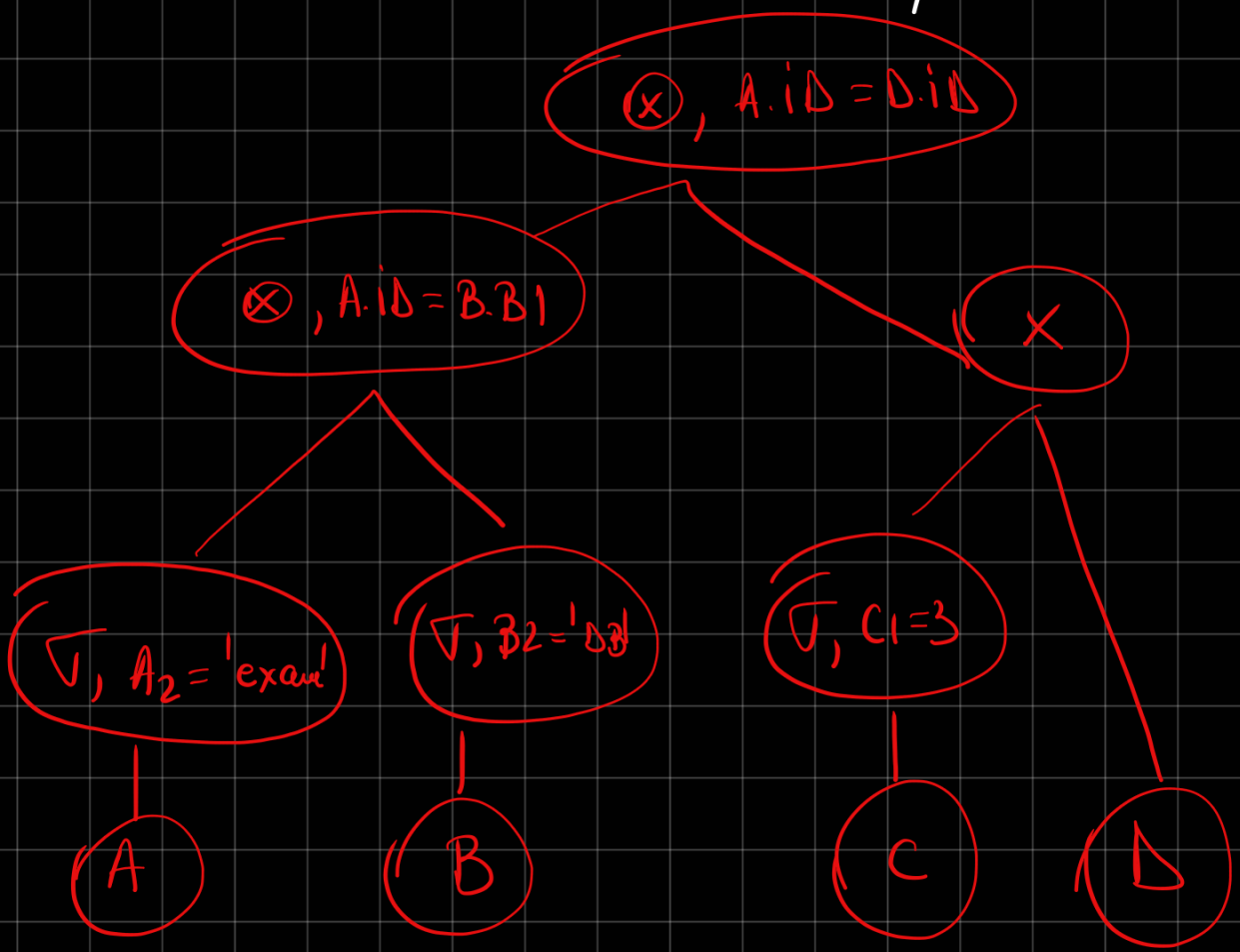
12. b, d

IV.

$$E = \left(\sigma_{ID=B1 \text{ AND } A2='exam' \text{ AND } B2='DB'} (A \times B) \right) * \left(\sigma_{C1=3} (C \times D) \right)$$

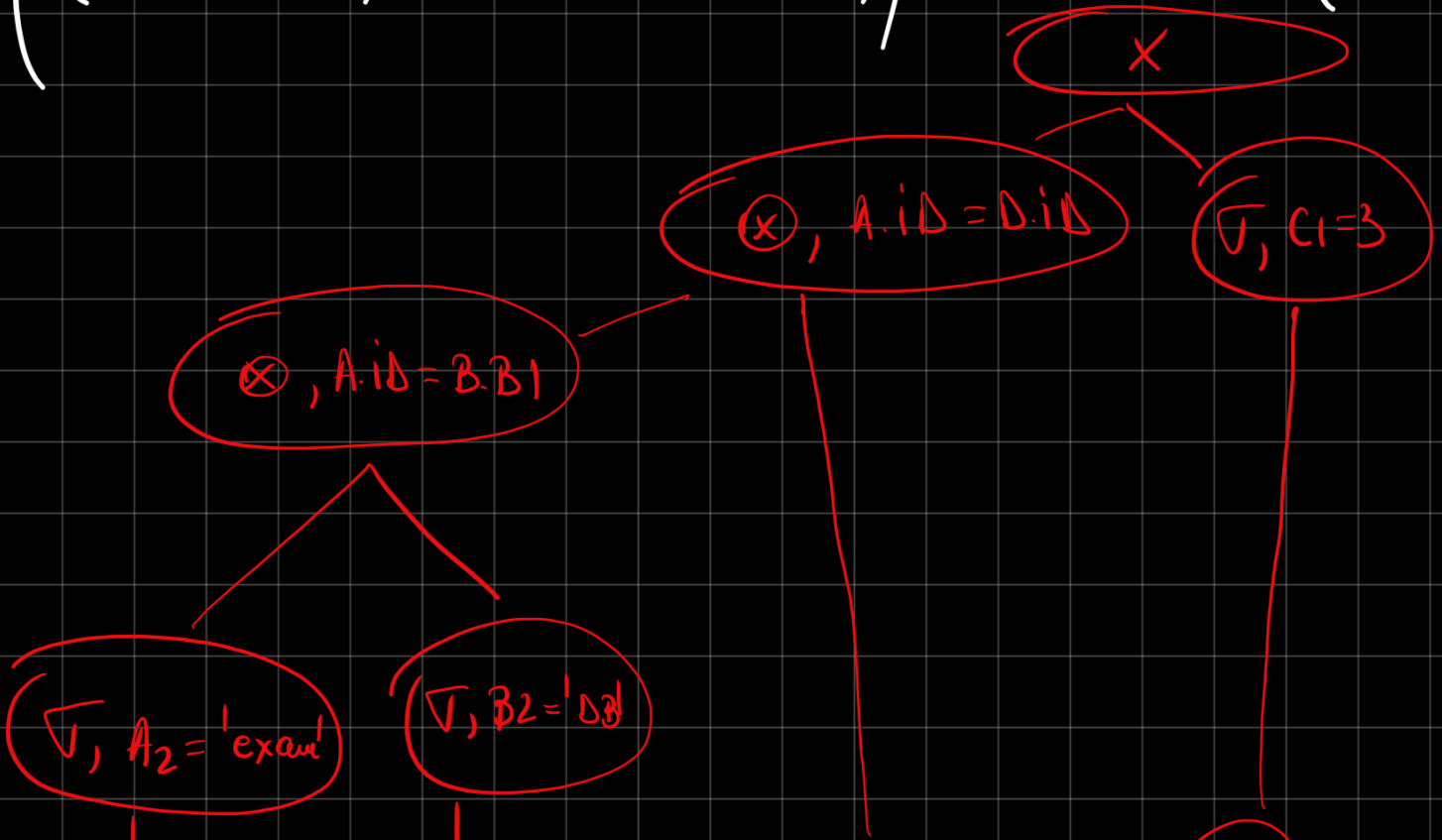
$$E = \left(\left(\sigma_{A2='exam'} (A) \right) \otimes_{ID=B1} \left(\sigma_{B2='DB'} (B) \right) \right) * \left(\sigma_{C1=3} (C) \times D \right)$$

$$E = \left(\left(\sigma_{A2='exam'} (A) \right) \otimes_{ID=B1} \left(\sigma_{B2='DB'} (B) \right) \right) \otimes_{A.ID=D.ID} \left(\sigma_{C1=3} (C) \times D \right)$$



Q2

$$E = \left(\left(\left(\sigma_{A_2 = \text{'exam'}}(A) \right) \bowtie_{ID = B1} \left(\sigma_{B2 = \text{'BB'}}(B) \right) \right) \bowtie_{A.ID = D.ID} D \times \left(\sigma_{C1=3}(C) \right) \right)$$

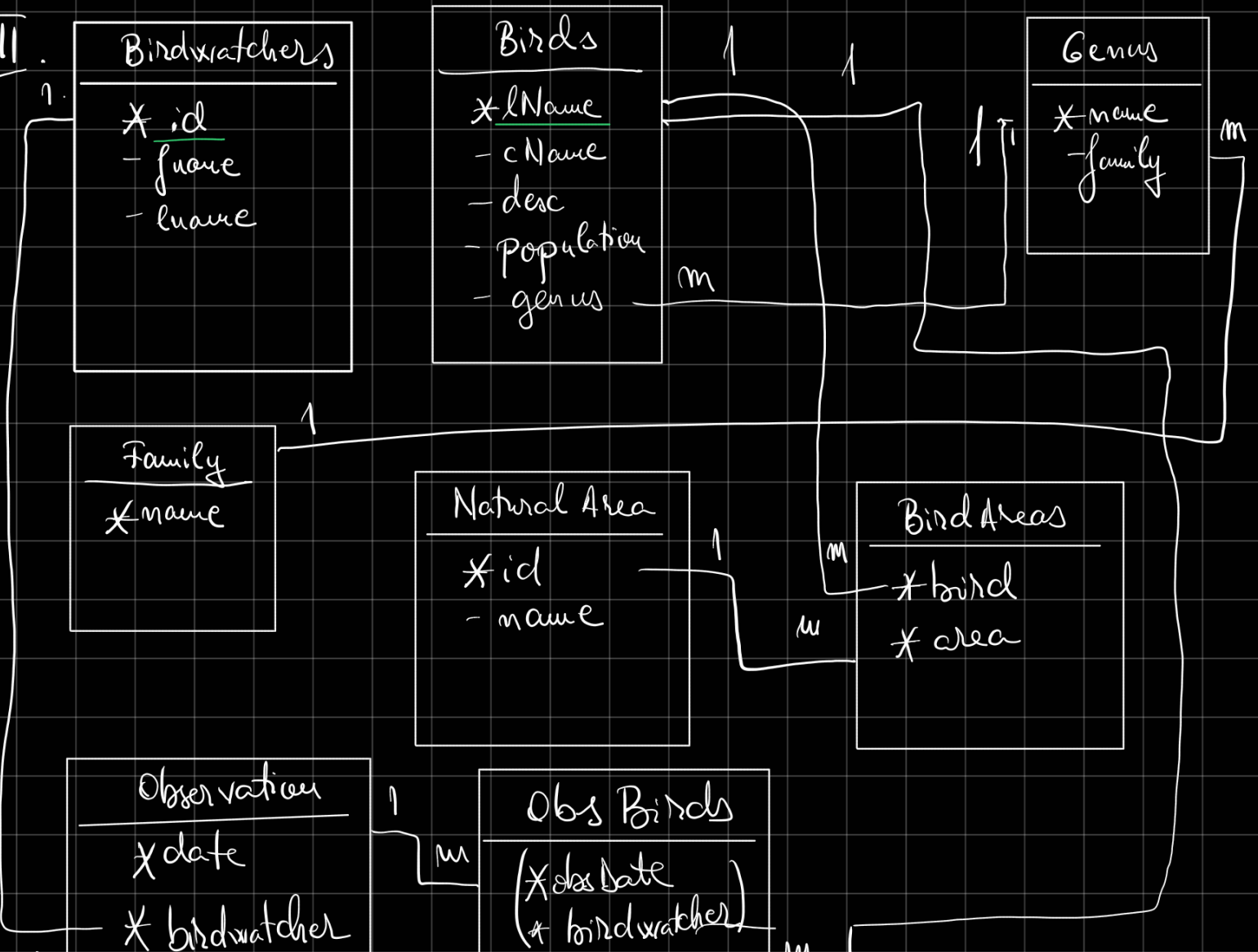


Model 2019

I. 1. A key is a minimal subset of attributes that uniquely identifies a record.

2. A clustered index is an optimised/sorted index, where the order of the rows is structured for quick access. In which the logical order det. physical ord.

II.



Use it for primary keys → easier.

---

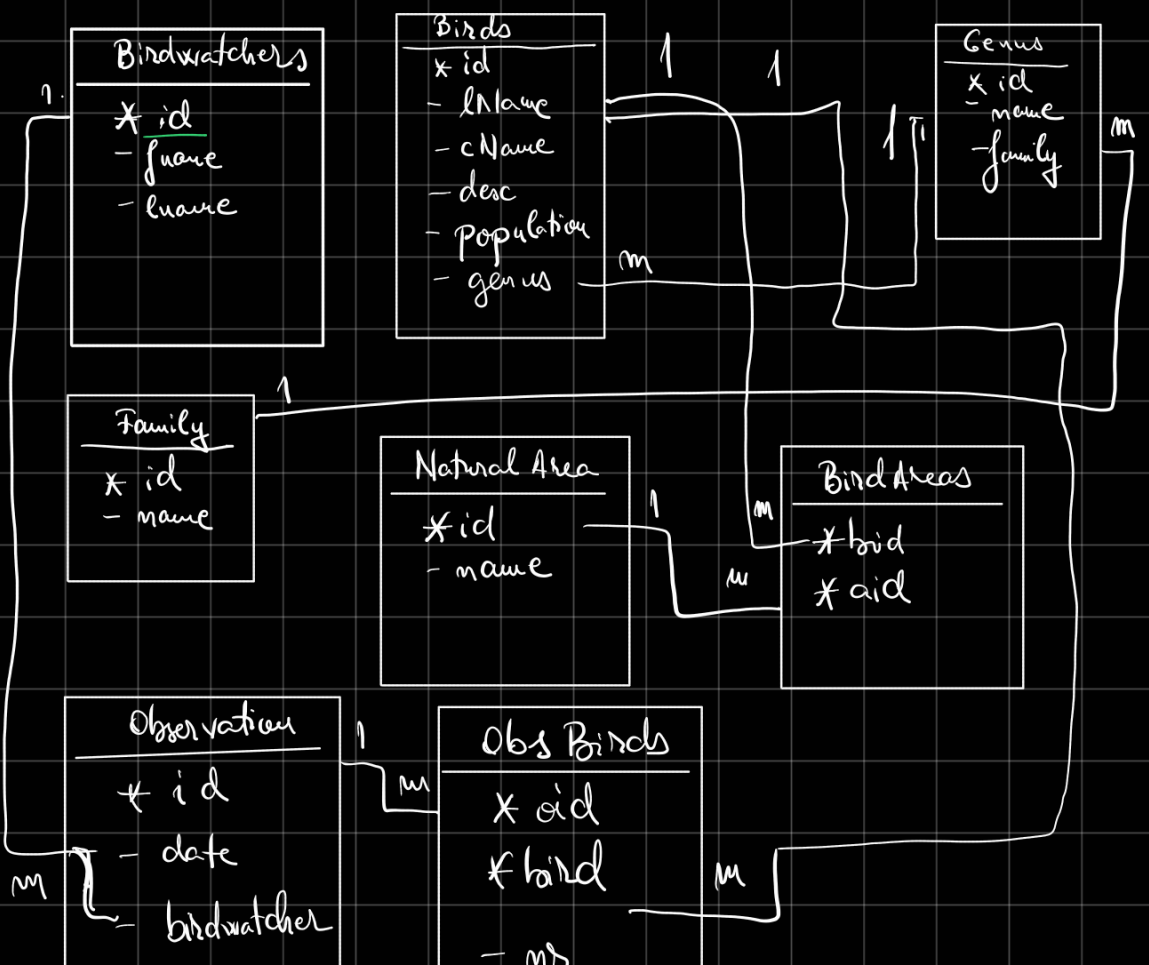
b.
```
CREATE TABLE ObsBirds
( obsDate DATETIME2,
  birdwatcher INT,
  bird VARCHAR(255),
  nr INT NOT NULL,
  FOREIGN KEY (obsDate, birdwatcher)
  REFERENCES Observation ( date, birdwatcher)
  ,
  PRIMARY KEY (obsDate, birdwatcher, bird)
)
```

(2.)
```
SELECT s1.fname, s1.lname, s1.c1, s2.c2
(SELECT o.fname, o.lname, COUNT(*) as c1, b1.date, b1.bwatchers
FROM Observations o
INNER JOIN Birdwatchers b ON o.birdwatcher = b.id
GROUP BY o.birdwatchers
```

```
HAVING COUNT(*) >= 10 ) s1
INNER JOIN
( SELECT COUNT(*) as C2, o1.date, o1.birdwatcher
  FROM ObsBirds o1
  INNER JOIN Birds b1 on o1.bird = b1.lname
  WHERE b1.genus = 'Aguila' ) s2

on s1.date = s2.date AND s1.birdwatcher =
                         s2.birdwatcher.
```

1.a.



2.a)

```
SELECT t1.fname, t2.lname, t1.NrObs, t2.NrObsS
FROM
(SELECT COUNT(*) as NrObs, b.fname, b.lname, b.id
 FROM BirdWatchers b
 INNER JOIN observations o ON b.id = o.birdwatcher
 GROUP BY b.fname, b.lname, b.id
 HAVING COUNT(*) >= 10)
 ) t1
 INNER JOIN
 (SELECT oo.birdwatcher, count(*) as NrObsS
  FROM ObsBirds ob INNER JOIN Observations oo
                   ON ob.oid = oo.id
  INNER JOIN Birds bb ON ob.bird = bb.id
  INNER JOIN Genus g on bb.genus = g.id
  WHERE g.name = 'Aquila'
  GROUP BY oo.birdwatcher) t2
  ON t1.id = t2.birdwatcher
 )
```

---

b.

$$\Pi_{cname, lname, pop}\left(\sigma_{pop<1000 \text{ AND } id \text{ IN } (\Pi_{bid}(\text{BirdAreas}))}(\text{Birds})\right)$$

III. 1. a, d.

2. c

3. c

4. c

5. a.

6. $20+21+22+23+24 \Rightarrow$ a.

7. a.

	A	B
2	A1	B1
1	A2	B2

B	C
B1	C1
B1	C2
B2	C1

A	C
A1	C1
A1	C2
A2	C1

$\Rightarrow 3-3=0.$

8. c, d

9. c

10. c

11. a

12. c, d

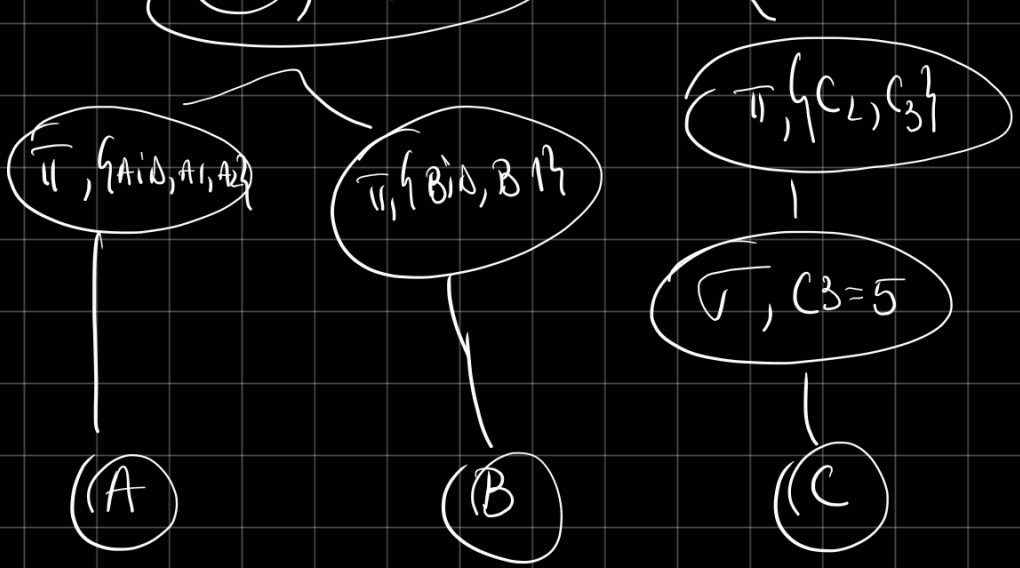
IV.

$$E = \sigma_{A.AID = B.B1 \text{ AND } B.BID = C.C2 \text{ AND } C.C3 = 5}\left(\Pi_{\{A.AID, A.A1, A.A2, B.BID, B.B1, C.C2, C.C3\}}(A \times B \times C)\right)$$

$$E = \Pi^{(A)}_{\{AID, A1, A2\}}\left(\otimes_{A.AID = B.B1} \Pi_{BID, B1}(B)\right) \otimes_{B.BID = C.C2} \left(\Pi_{C2, C3}\left(\sigma_{C3=5}(C)\right)\right)$$

$\otimes, BID = C_2$

$\otimes, AID = B1$


π, {A, D, A1, A2}
π, {B, D, B1}
π, {C2, C3}
σ, C3=5
A
B
C