CHALMERS
EXAMINATION / TENTAMEN

Course code/kurskod	Course name/kursnamn			
DIT03~~3~~2	DATA MANAGEMENT			
Anonymous code Anonym kod	Examination date Tentamensdatum	Number of pages Antal blad	Grade Betyg	
246	2022·08·17	~~5~~ 6	~~5~~ VG	

* I confirm that I've no mobile or other similar electronic equipment available during the examination.
Jag intygar att jag inte har mobiltelefon eller annan liknande elektronisk utrustning tillgänglig under eximinationen.

Solved task Behandlade uppgifter No/nr		Points per task Poäng på uppgiften	Observe: Areas with bold contour are to completed by the teacher. Anmärkning: Rutor inom bred kontur ifylles av lärare.
1	X	14.+1	
2	X	19.	
3	X	16.	
4	X	12.	
5	X	17,5.	
6	X	5.5.	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
Bonus poäng			
Total examination points Summa poäng på tentamen		85	

CHALMERS	Anonymous code / Anonym kod: 246	Points for question (to be filled in by teacher) / Poäng på uppgiften (ifylles av lärare)	Consecutive page no. / Löpande sid nr: # 2
			Question no. / Uppgift nr: 1.1, 1.2, 1.3, 1.4

1.1 CRUD stands for CREATE, ~~REMOVE~~ (READ?), UPDATE, DELETE. In SQL, this would be:

```
CREATE TABLE employee(
    id INT PRIMARY KEY,
    name VARCHAR
);

INSERT INTO employee (1, 'Nayla Nasir');

SELECT id
FROM employee
WHERE name='Nayla Nasir';
```

Delete? 4

1.2 Table-per-class is when every entity type becomes a relation. This is joined through 1:1 relations. Disjoint-partial would use foreign keys to handle relationships, ~~one for~~ supertype and one for subtype. Also disjoint/total or overlapping/total

Table-per-subclass is where only subtypes become relations. Attributes of supertype are then added to subtype. This would be a disjoint/total, where it is mapped as two relations

5

Single table are single relations that contain all attributes, potentially a discriminator/role attribute. This would be overlapping/total. & partial

1.3

T1	T2
read-item(X);	
X:=X-N;	
write-item(X);	
	read-item(X);
	X:= X+M;
	write-item(X);
read-item(Y);	

3

Transaction of T1 fails and must change the value of X back to its old value. T2 reads the incorrect temporary value of X

Dirty reads can return uncommitted data of other transactions (temporary updates)

1.4 Replication is useful to increase availability, as the same data items are available in other data sites; this helps avoid downtime for when master is down. A consequence of replication is that it can be more difficult/expensive.

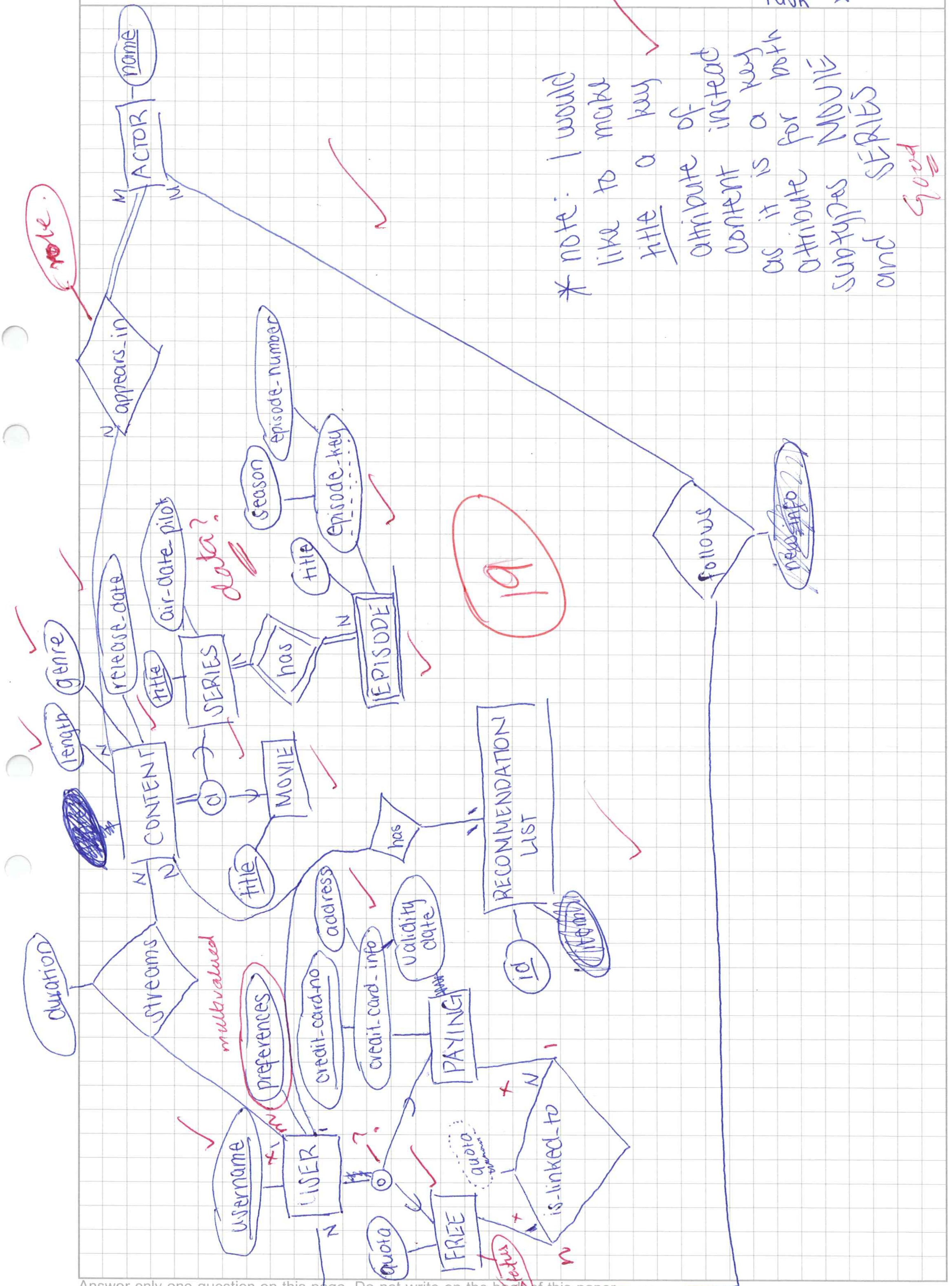
3

Sharding splits up data between multiple nodes. Unlike replication, however, they do not keep the same data across multiple data sites. Sharding is a basic mechanism for dealing with data at scale. Example would be Big Data (eg 4million user interactions on Facebook)

Both approaches lead to distributed databases. Replication is more concerned with availability while sharding distributes to manage large data

3

CHALMERS	Anonymous code / Anonym kod: 246	Points for question (to be filled in by teacher) / Poäng på uppgiften (ifylles av lärare)	Consecutive page no. / Löpande sid nr: 3
			Question no. / Uppgift nr: TASK 2



* note: I would like to make title a key attribute of content instead as it is a key attribute for both subtypes MOVIE and SERIES

Good

3

CHALMERS	Anonymous code 246	Points for question (to be filled in by teacher)	Consecutive page no. Löpande sid nr 5
	Anonym kod	Poäng på uppgiften (ifylles av lärare)	Question no. Uppgift nr TASK 3

USER(username, preferences) ✓

FREE_USER(user, quota)
  user -> USER. username ✓

PAYING_USER(user, credit-card-info) its better to include all parts of composite attributes.
  ~~USER~~ -> USER. username

CONTENT (length, genre, release-date~~s~~, title) ✓

MOVIE (title)
  title -> CONTENT. title ✓

SERIES (title, pilot-air-date)
  title -> CONTENT. title ✓ - include all parts of composite att.

EPISODES(series, title, episode-key) - episode key is also a part of the primary key.
  series -> SERIES. title

ACTOR (name, appears) appears is a n:m relationship, so should be represented as a relation.
  ~~[illegible]~~ appears -> CONTENT. title

RECOMMENDATION_LIST (~~user~~, content, id) Ternary relationship not represented correctly.
  user -> USER. username
  content -> CONTENT. title

FOLLOWER (user, actor)
  user -> USER. username ✓
  actor -> ACTOR. name

STREAM (user, content, duration)
  user -> USER. username ✓
  actor -> ACTOR. name

IS_LINKED_TO (free, paid)
  free -> FREE_USER. user ✓
  paid -> PAYING_USER. user

$\boxed{16}$

Answer only one question on this page. Do not write on the back of this paper
Behandla endast en uppgift på detta blad. Skriv ej på baksidan

3

CHALMERS	Anonymous code 246	Points for question (to be filled in by teacher)	Consecutive page no. Löpande sid nr 6
	Anonym kod	Poäng på uppgiften (ifylles av lärare)	Question no. Uppgift nr TASK 4

use assignment operator.

4.1 $\rho_{CI\ duration}(\pi_{end-start}(COURSE\_INSTANCE))$

$\pi_{COURSE\_INSTANCE.course,\ CI.duration}$

$\boxed{0}$ $(\sigma_{course \wedge duration}(\sigma_{year=2019}(COURSE\_INSTANCE))$

$(COURSE\_INSTANCE \times CI))$

4.2 RESULT <- $STUDENT \bowtie_{student=id} (COURSE \bowtie_{shortname=course} STUDENT\_COURSE\_INSTANCE$

id = student ✓ $\boxed{5}$

$\pi_{name}(\sigma_{fullname=Data\ Management}(RESULT))$ ✓

4.3 $\pi_{name}(\mathcal{F}_{MAX\ salary}(\sigma_{course=0}(TEACHER)))$

~~4.4 π course~~

Cannot combine projection with aggregation in this way. NULL $\boxed{2}$

4.4 ~~π shortno~~

~~$\pi_{COURSE.shortname,\ COURSE.fullname}$~~

$\pi_{shortname,\ fullname,\ syllabus,\ year}(COURSE \bowtie_{shortname=course} COURSE\_INSTANCE$

✓

$\boxed{5}$

3

CHALMERS	Anonymous code 246	Points for question (to be filled in by teacher)	Consecutive page no. Löpande sid nr 7
	Anonym kod	Poäng på uppgiften (ifylles av lärare)	Question no. Uppgift nr TASK 5

5.1
```
DROP IF TABLE EXISTS student-courseinstance CASCADE;
CREATE TABLE student-courseinstance (
        course VARCHAR (10), ✓
        student INT,
        year INT,
        grade INT,        CHECK (grade is < 6) ?
        FOREIGN KEY (course, year) REFERENCES course_instance (course, year) ✓
        FOREIGN KEY (student) REFERENCES student (id) ✓
);              ON DELETE CASCADE;     3
```

5.2
```
SELECT shortname, fullname
FROM   course
WHERE  syllabus = '%database';     4.5
                LIKE
```

5.3
```
~~SELECT t.name, t.salary~~
~~FROM teacher AS t~~
~~JOIN ~~student~~~~
                  DISTINCT — ?

SELECT teacher.name, teacher.salary
FROM   teacher, student-courseinstance, student
WHERE  teacher.course = student-courseinstance.course AND student.id
       = student_courseinstance.student AND student.name = 'Anna Berg'
ORDER BY teacher.salary DESC; ✓     5
```

5.4
```
SELECT name
FROM   teacher
WHERE  salary > ALL (SELECT AVG(salary)
                     FROM teacher);
       5
```

3

CHALMERS	Anonymous code 246	Points for question (to be filled in by teacher)	Consecutive page no. Löpande sid nr 8
	Anonym kod	Poäng på uppgiften (ifylles av lärare)	Question no. Uppgift nr TASK 6

```
<?xml version="1.0" encoding="UTF-8" ?> ✓
  <employee id="146"> ✓
       <name fname="Nayla" lname="Nasir" /> ✓
       <departments>
<department> CSE </department>
       </departments>
       <projects>
          <project id="14" name="CONF-2" />
          <project id="21" name="Immersed" /> ✓
       </projects>
       <courses>
          <course> DIT033</course>
          <course> DAT335</course>
          <course> DAT295</course>
       </courses>
       <started-at> 01.09.2020</started-at>
  </employee>
```
✓

5.5

Answer only one question on this page. Do not write on the back of this paper
Behandla endast en uppgift på detta blad. Skriv ej på baksidan