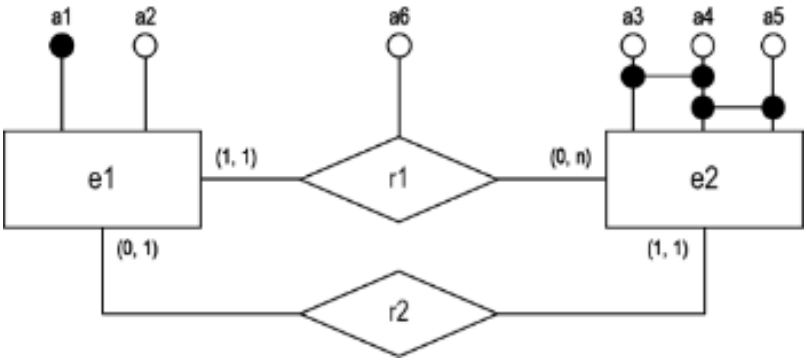
CS2102-2425-s2-midterm

Question #: 1

(1 point, MCQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).
Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa.
Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



How many tables are created?

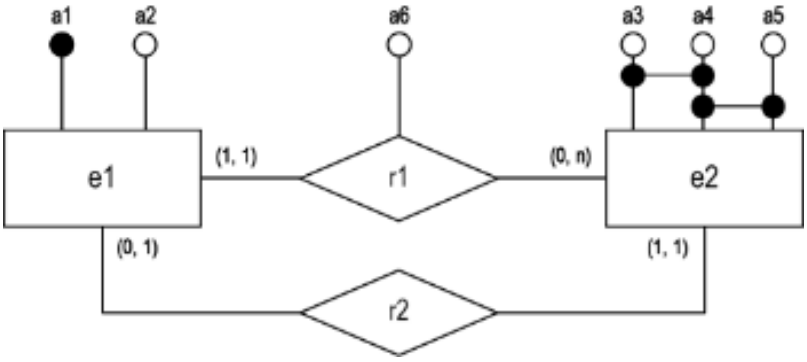
A. 1
B. 2
C. 3
D. 4
E. None of the above

Attachment:
attachment_for_itemid_299168.png

Question #: 2

(2 points, MRQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).

Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa. Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Which of the following properties are true in at least one schema translation? Select all answers that apply.

A. (a1) is a foreign key in the table for e2. (a1) in the table for e2 is referencing (a1) in the table for e1
B. (a2) is a foreign key in the table for e2. (a2) in the table for e2 is referencing (a2) in the table for e1
C. (a1) is a foreign key in the table for e2. (a1) in the table for e2 is referencing (a1) in the table for r1
D. (a2) is a foreign key in the table for e2. (a2) in the table for e2 is referencing (a2) in the table for r1
E. None of the above

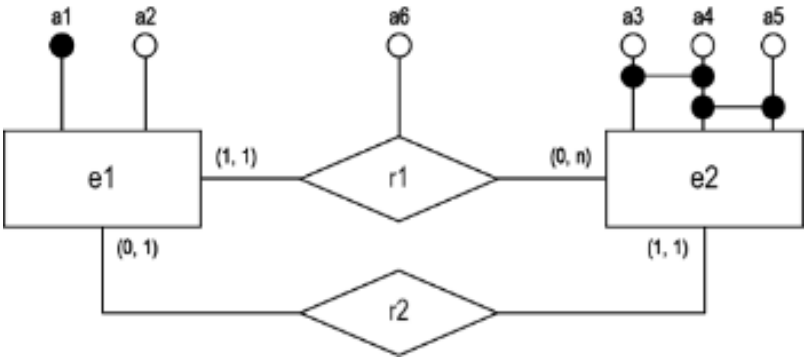
Attachment:

attachment_for_itemid_299383.png

Question #: 3

(2 points, MRQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).

Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa. Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Which of the following properties are true in at least one schema translation? Select all answers that apply.

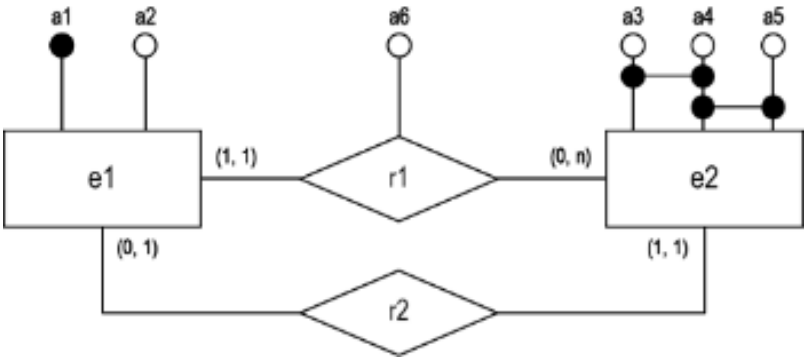
A. (a3, a4) is a foreign key in the table for e1. (a3, a4) in the table for e1 is referencing (a3, a4) in the table for e2
B. (a4, a5) is a foreign key in the table for e1. (a4, a5) in the table for e1 is referencing (a4, a5) in the table for e2
C. (a3, a4) is a foreign key in the table for e1. (a3, a4) in the table for e1 is referencing (a3, a4) in the table for r2
D. (a4, a5) is a foreign key in the table for e1. (a4, a5) in the table for e1 is referencing (a4, a5) in the table for r2
E. None of the above

Attachment:

attachment_for_itemid_299406.png

Question #: 4

(2 points, MRQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).
Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa.
Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Which of the following properties are true in at least one schema translation? Select all answers that apply.

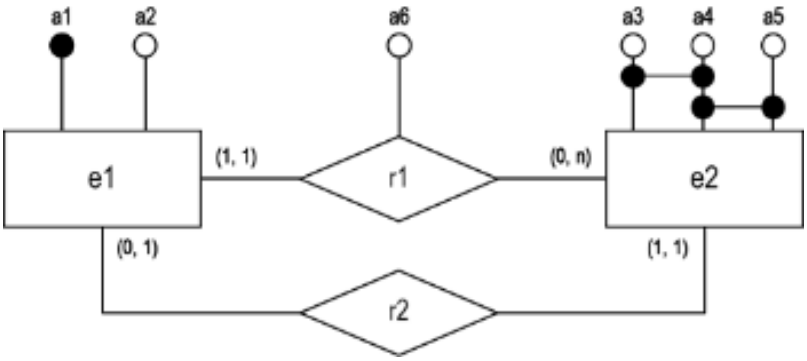
A. The primary key for the table for r1 is (a1)
B. The primary key for the table for r1 is (a3, a4)
C. The primary key for the table for r1 is (a4, a5)
D. The primary key for the table for r1 is (a1, a3, a4)
E. The primary key for the table for r1 is (a1, a4, a5)
F. The primary key for the table for r1 is (a1, a3, a4, a5)
G. None of the above

Attachment:

attachment_for_itemid_299410.png

Question #: 5

(2 points, MRQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).
Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa. Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Which of the following properties are true in at least one schema translation? Select all answers that apply.

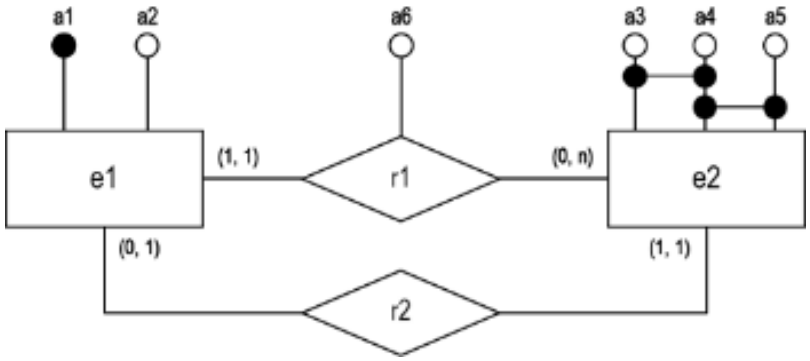
A. The primary key for the table for r2 is (a1)
B. The primary key for the table for r2 is (a3, a4)
C. The primary key for the table for r2 is (a4, a5)
D. The primary key for the table for r2 is (a1, a3, a4)
E. The primary key for the table for r2 is (a1, a4, a5)
F. The primary key for the table for r2 is (a1, a3, a4, a5)
G. None of the above

Attachment:

attachment_for_itemid_299413.png

Question #: 6

(2 points, MCQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).
Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa. Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Assume that there are 100 entities belonging to the entity set e1. What is the minimum number of entities belonging to the entity set e2?

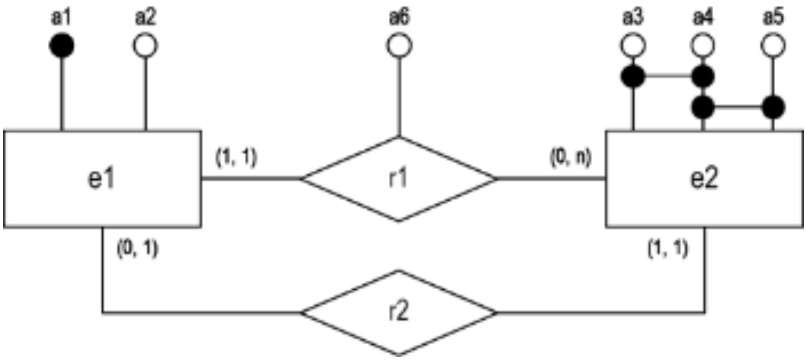
A. 0
B. 1
C. 99
D. 100
E. 101
F. unbounded
G. None of the above

Attachment:

attachment_for_itemid_299417.png

Question #: 7

(2 points, MCQ) Consider the entity-relationship diagram attached and reproduced below. We will follow only the process discussed in the lecture (*i.e., 3 rules +3 exceptions*).
Let u and v be entity sets or relationship sets. If during the schema translation, the table for **u1** and the table for **u2** are merged, we refer to it as the table of **u1** or the table of **u2**. Any properties that is true for the table for **u1** should also be true for table for **u2** and vice versa. Assume that a schema translation is possible which may require additional `ALTER TABLE` to resolve circularity.



Assume that there are 100 entities belonging to the entity set e1. What is the maximum number of entities belonging to the entity set e2?

A. 0
B. 1
C. 99
D. 100
E. 101
F. unbounded
G. None of the above

Attachment:

attachment_for_itemid_299422.png

Question #: 8

(3 points, SQL) You may find the logical diagram generated using pgAdmin in the attachment to this question.

Find the European team name that participated in the contest in a different region. The region of the team is the region of the University the team is from. The region of the contest is the region of the site. Order the result in ascending order of team name.

The European teams are team from University in the region `'Europe'`.

The result should look like the table below. Queries with different results may get partial marks.

name	**site**	**year**
Quantum Coders	Pacific Northwest	2024
STM32G431CB	Pacific Northwest	2023
UW1	North Central NA	2024
UW2	North Central NA	2024

Attachment:

attachment_for_itemid_299433.jpg

Question #: 9

(3 points, SQL) You may find the logical diagram generated using pgAdmin in the attachment to this question.

Find the least popular contest. The least popular contest is the contest with the fewest number teams participating. Order the result in ascending order of contest site name followed by ascending order of year. There may be multiple least popular contest, your query should output all the least popular contests.

The result should look like the table below. Note that in our data set, there is only one least popular contest but your query should work even if there are multiple results. Queries with different results may get partial marks.

site	year
South Central USA	2023

Attachment:

attachment_for_itemid_299448.jpg

Question #: 10

(3 points, SQL) You may find the logical diagram generated using pgAdmin in the attachment to this question.

Find the average number of problems solved in the European constest. In the computation of the average, exclude the teams that do not solve any question in that contest. For instance, if there are only two teams T1 and T2 in a contest. If T1 solves 5 and T2 solves 0, then the average is exactly 5. Also exclude the contest where no teams solve at least 1 question.

The European contests are contests from sites in the region `'Europe'`.

Round the average to 2 decimal places. Use the function `ROUND(avg, 2)` to round the value of `avg` to 2 decimal places. Sort the result in descending order of average number of solve. This sorting should be done before rounding.

The result should look like the table below. Note that in our data set, there is only one least popular contest but your query should work even if there are multiple results. Queries with different results may get partial marks.

site	year	avg
Northwestern Europe	2024	6.91
Southwestern Europe	2024	5.40
Central Europe	2024	4.99
Southeastern Europe	2024	4.89
Northwestern Europe	2023	4.80
Southwestern Europe	2023	4.75
Central Europe	2023	4.19
Southeastern Europe	2023	3.76

Attachment:

attachment_for_itemid_299651.jpg

Question #: 11

(3 points, SQL) You may find the logical diagram generated using pgAdmin in the attachment to this question.

Find the last contest of the year in each region. The last contest in the contest in a given year is the contest with the largest date. You can simply compare two dates d1 and d2 using relational operation. For instance, d1 >d2 is true when d1 is larger than d2.

There may be multiple contest with the same date. For instance, in North America, we have multiple contests on the same date. Note that the contest can take place in the following year. For example, contest in North America for the year 2023 can be held in February of 2024.

Output the contest name and contest year. Sort the result in ascending order of contest name.

The result should look like the table below. Queries with different results may get partial marks.

name	year
The 2023 ICPC Mid-Central USA Regional Contest	2023
The 2023 ICPC Pacific Northwest Regional Contest	2023

The 2023 ICPC South Central USA Regional Contest	2023
The 2023 ICPC Southeast USA Regional Contest	2023
The 2023 ICPC Southwestern Europe Regional Contest	2023
The 2024-2025 ICPC South Central USA Regional Contest	2024
The 2024 ICPC Central Europe Regional Contest	2024
The 2024 ICPC Mid-Atlantic USA Regional Contest	2024
The 2024 ICPC Pacific Northwest Regional Contest	2024
The 2024 ICPC Southeast USA Regional Contest	2024
The 2024 ICPC Southern California Regional Contest	2024

Attachment:

attachment_for_itemid_299656.jpg