

Database Writing Activity

Learning objectives

- Review some key concepts of relational database systems

Reading questions

1. Name and describe four key properties of a relation. (4 points)
2. Name the two properties of all candidate keys. Briefly explain what the properties mean. (4 points)
3. What is a foreign key? (1 point)
4. Explain the concept of referential integrity with an example. In general, when should you set up a referential integrity constraint? In general, what happens if you don't? (3 points)
5. Briefly describe the difference between logical and physical data independence. (2 points)
6. What is the system catalog? What information that can be obtained from a system catalog (give three examples)? Where is the system catalog stored? (3 points)
7. Using just the "difference" operator define the "intersection" operator. (1 point)
8. Using the fundamental operators, sketch out a relational algebra expression for this SQL statement (3 points)

```
SELECT id, a, b
FROM R, S
WHERE R.id = S.id and a > 10;
```

9. Consider the two relations, R and S (2 points):

<u>R</u> <u>ID</u>	A	B	<u>S</u> <u>ID</u>	C
1	a	x	1	m
2	b	y	3	n
3	c	z	4	o

Show the result for R (left-outer-join) S. What is the degree and cardinality of the result?

Continued ...

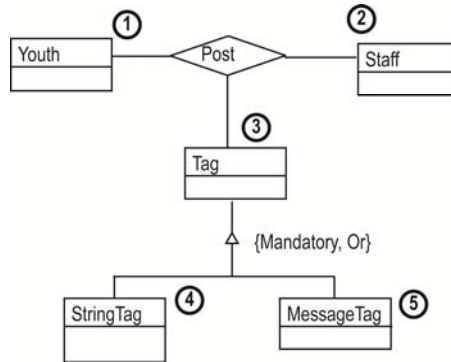
10. Using the operators Cartesian product, projection, selection, difference, and union construct a relational algebra expression for computing $R \bowtie S$ (left-outer-join). Using the data from the previous question, please carefully show and describe each step in the process. (6 points)

Use this format to present your solution:

Step	Expression (using operators)	Explanation
1	...	...
2	...	...
...	...	...

Please Note: Expect to spend some time on this problem; it is not so straightforward. Please try to develop your own solution; if you use resources from the web please cite those resources. When showing your work, aim for a concise, clear presentation.

11. Precisely define **functional dependency**, **1NF**, **2NF**, and **3NF**. (4 points)
- 12.



Consider the above conceptual model – an initial sketch that you might draw on a whiteboard. The basic idea of this model is to allow a STAFF PERSON (2) to post or submit TAGS (3) concerning a particular YOUTH (1). Thus, the concept “post” is a ternary relationship, involving a STAFF PERSON, a YOUTH, and a TAG. In addition, TAGS can be of two types. STRINGTAG (4) consists of a single attribute: A string or short phrase. MESSAGETAGS (5), on the other hand, are more complex. They consist of the following attributes: A type (either “note,” “special date,” “news,” or “reminder”), a visibility indicator (either “public” or “private”), a date (to be used for “special dates”), and a note (to contain the contents of the message tag).

- Given this sketch of a conceptual model, propose a logical model, in 3NF, consisting of entities and 1-1 or 1-M relationships. Please do not include M-M relationships in your model. Employ UML notation rigorously to represent your model. You can draw your model neatly by hand, use the Adobe Illustrator shapes on the course website, or use another drawing tool. But, however you draw the model, follow rigorous UML notation. (8 points)
- Given your logical model, transform it into SQL. Create domains as appropriate (see CREATE DOMAIN) and include the appropriate referential integrity constraints. Finally, please comment your SQL code to concisely and clearly describe attributes, and referential integrity constraints, and so forth. (4 points)