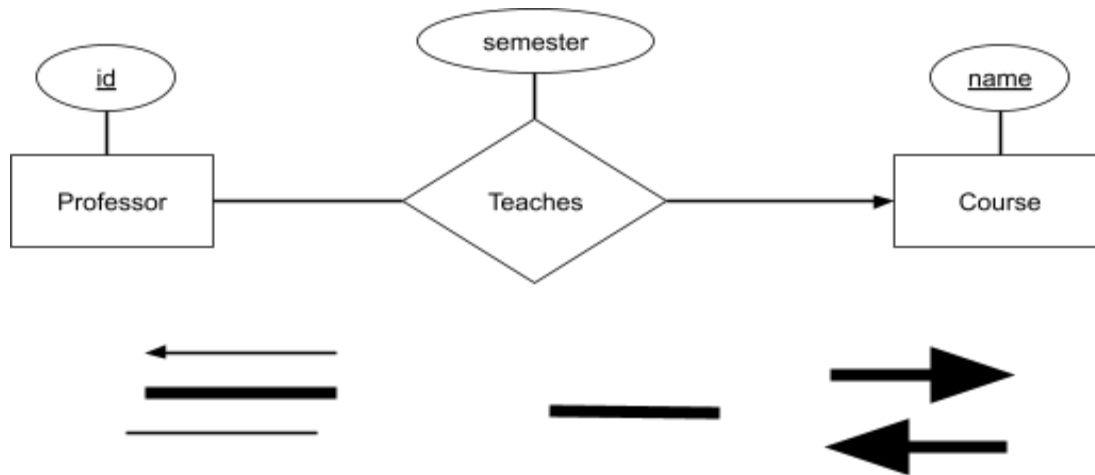


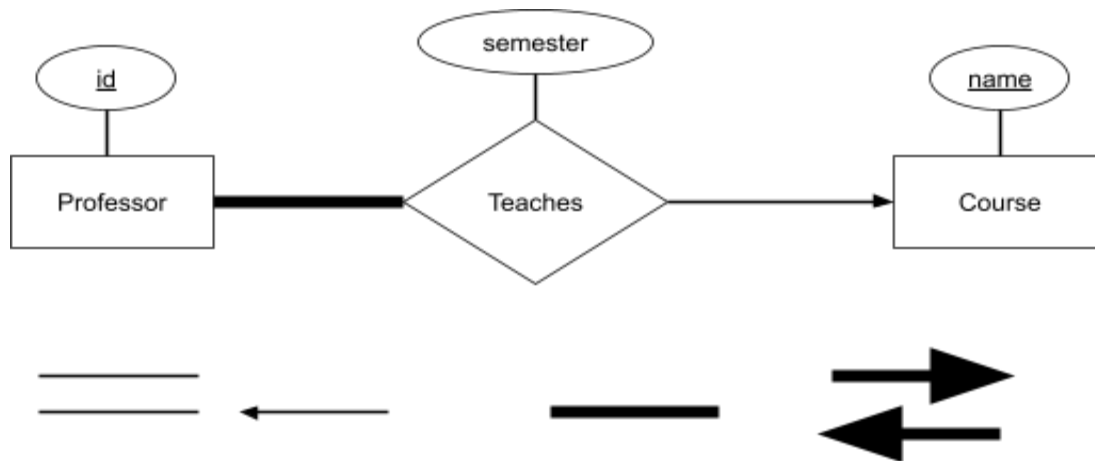
Problem Set 1: Part I

Problem 1: ER diagram basics

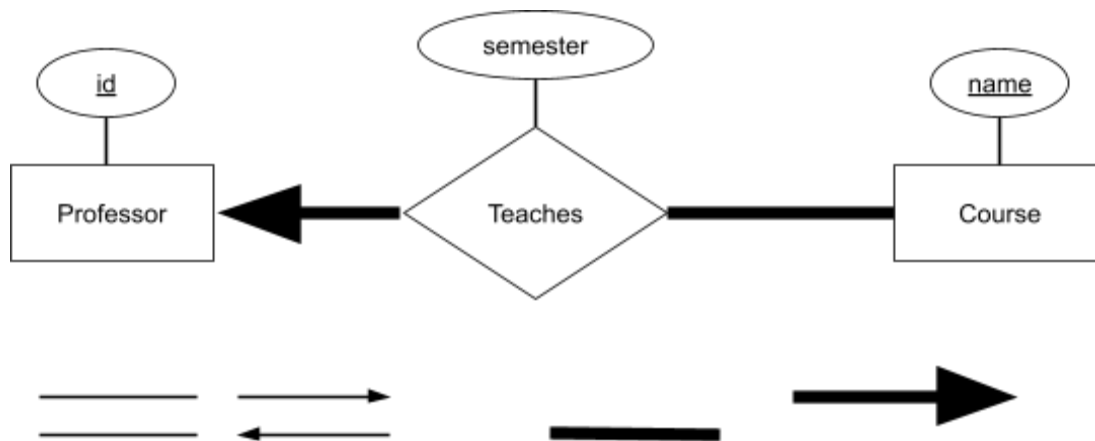
1.



2.



3.



Problem 1 (cont)

4. No. Since each semester every professor can only teach at most one course, taking the union of professor and course as a primary key does not ensure that the professor teaches at most one course each semester, as he/ she can teach different courses. Thus, taking the union of professor and semester would be the correct solution as it constraints that every professor can only teach at most one course each semester.

Problem 2: Database design

1. Manages is a many-to-one relationship from Author to Agent
2. Description of constraints:
 - a. The thick line between Author and Agent: each author is managed by at least one agent
 - b. The arrow from Author to Agent: each author is managed by at most one agent
 - c. The thick line between Author and Appearance: Each appearance will have at least one author
3. Schema:
 - a. Author(_id_, agent_id, name, address)
 - Here I eliminate Manages relationship and capture the relationship set in Author, because it is a many-to-one relationship from Author to Agent.
 - Foreign key is agent_id from Agent relation: each value of agent_id attribute in Author must match a value of the id attribute from Agent relation
 - b. Agent(_id_, name, office #)
 - c. Book(_isbn_, title)
 - d. Appearance(_date_, _location_)
 - e. Wrote(_isbn_, author_id, publisher)
 - Foreign keys are id from Author and isbn from Book: each value of isbn attribute in Wrote must match a value of the isbn attribute from Book relation
 - f. WillAppear(_id_, _date_, _location_)
 - Foreign keys are id from author and date and location from Appearance: each value pair of date and location attributes in Will Appear must match a value pair of date and location attributes in Appearance relation. Each value of id attribute in WillAppear must match a value of id attribute in Author relation.

Problem 3: Combining relations

Use the Insert->Table menu option to insert an appropriate table for each answer.

1. Cartesian product of R and S,

R.a	R.b	c	S.b	S.a
1	2	1	2	3

1	2	3	4	3
1	2	7	6	5
3	4	1	2	3
3	4	3	4	3
3	4	7	6	5
5	6	1	2	3
5	6	3	4	3
5	6	7	6	5

2. Natural join of R and S

a	b	c
3	4	3
5	6	7

3. Left outer join of R and S

a	b	c
1	2	null
3	4	3
5	6	7

4. Right outer join of R and S

a	b	c
3	2	1
3	4	3
5	6	7

5. Full outer join of R and S

a	b	c
1	2	null

3	4	3
5	6	7
3	2	1