CS 482/502 Database Management Systems I
Fall 2018
Midterm Exam (1 hour 15 minutes)

- If any of the questions are not clear, please state your assumptions. If they are reasonable, I will take them into consideration.
- Note that, I will not give credit to the length of your answers, but to their correctness and your grasp of the topic.
- There are four questions. The total grade is 100.
- There is also an extra credit question. This grade will not be added to your exam grade, but may be used at the end of the semester to resolve border cases. Therefore, if you think there is no chance you will be a border case, you do not need to provide an answer to this question.
- Do not forget to write your name and your affiliate ID (preferably on all pages) before you turn in your paper.

Question	Max	Grade
1	25	
2	25	
3	25	
4	25	
Total	100	
Extra credit	10	

- **Question 1 (25 pts):**

  Consider the following relational schema. An employee can work in more than one department; An employee can manage more than one department; *managerid* and *eid* belong to the same domain.

  Emp (*eid*: integer, *ename*: string, *age*: integer, *salary*: real)
  Works (*eid*: integer, *did*: integer, *pct_time*: integer)
  Dept (*did*: integer, *budget*: real, *managerid*: integer)

  Write an SQL query for the following:

  1. (10 pts) Find the names and ages of each employee who works in both the Hardware department and the Software department

  2. (15 pts) Find the names of managers who manage only departments with budgets greater than $1 million

- **Question 2 (25 pts):**

  Consider the following relational schema. An employee can work in more than one department; An employee can manage more than one department; *managerid* and *eid* belong to the same domain.

  Emp (*eid*: integer, *ename*: string, *age*: integer, *salary*: real)
  Works (*eid*: integer, *did*: integer, *pct_time*: integer)
  Dept (*did*: integer, *budget*: real, *managerid*: integer)

  Write an SQL query for the following:

  1. (10 pts) If a manager manages more than one department, he or she *controls* the sum of all the budgets for those departments. Find the managerids of managers who control more than $5 million.

  2. (15 pts.) Find the managerids of managers who control the largest amounts

- **Question 3 (25 pts):**

  Consider the following relational schema. An employee can work in more than one department; An employee can manage more than one department; *managerid* and *eid* belong to the same domain.

  Emp (*eid*: integer, *ename*: string, *age*: integer, *salary*: real)
  Works (*eid*: integer, *did*: integer, *pct_time*: integer)
  Dept (*did*: integer, *budget*: real, *managerid*: integer)

  Write an SQL query for the following:

  1. (10 pts) Find the highest salary in each department

  2. (15 pts.) Find the name of the youngest employee with age less than 60 for each department, in which the total number of employees is greater than the average number of employees.

- **Question 4 (25 pts):**

  Consider the following relational schema. An employee can work in more than one department; An employee can manage more than one department; *managerid* and *eid* belong to the same domain.

  Emp (*eid*: integer, *ename*: string, *age*: integer, *salary*: real)
  Works (*eid*: integer, *did*: integer, *pct_time*: integer)
  Dept (*did*: integer, *budget*: real, *managerid*: integer)

  Write a Relational Algebra query for the following:

  1. (10 pts) Find the average salary of all employees

  2. (15 pts.) Find the *did* of departments whose budget is greater than the average budget of all departments

- **(Extra Credit Question: 10 pts; *This grade will not be added to your exam grade, but may be used at the end of the semester to resolve border cases. Therefore, if you think there is no chance you will be a border case, you do not need to provide an answer to this question.*)**

  Consider the following relational schema. An employee can work in more than one department; An employee can manage more than one department; *managerid* and *eid* belong to the same domain.

  Emp (*eid*: integer, *ename*: string, *age*: integer, *salary*: real)
  Works (*eid*: integer, *did*: integer, *pct_time*: integer)
  Dept (*did*: integer, *budget*: real, *managerid*: integer)

  Write an SQL query for the following:

  Find the names of managers who manage only departments with budgets larger than 1 million, but at least one department with budget less than 5 million