

# Exercise Session: 4

7 December 2017

## 1 Relational algebra (2 parts, 8p)

A multi-national company uses a relational database to manage information about its offices in different cities, and its employees. This database has the following relations:

```
Offices(city, supplement)
Departments(city, dname, departmentHead)
Employees(empId, name, salary, dept, city)
```

The company has one office in each city, and several departments can be located at each office. Attribute `supplement` is the monthly salary supplement that each employee working at that office receives (e.g. employees at the London office might receive a supplement of 1000 SEK per month to cover higher living costs in London). The default city supplement is 0 SEK. Attribute `dname` describes the departments function (e.g. sales or personnel). Attribute `departmentHead` is the employee identifier of the head of the department. Employee identifiers (`empId`) are unique. Attribute `salary` is an employees basic monthly salary. The total monthly salary for an employee can be calculated by adding the city supplement to the employees basic monthly salary.

- 4a. Write a relational algebra expression that finds the employee identifier, name and total monthly salary of all employees (recall that the total monthly salary for an employee can be calculated by adding the city supplement to the employees basic monthly salary). The results should be sorted by employee name. (4p)
- 4b. Write a relational algebra expression that finds the names of cities where there is a sales department (named “sales”) and, for each of these departments, the average basic salary of the employees in that department. You can assume that every department has at least one employee. (4p)