**Homework Guidelines**

**Homework can be completed as a Group Assignment**

For the sake of your understanding of this course's material, it is important that you complete assignments based on what you know. Homework provides you the opportunity to test yourself in a flexible learning environment - at home, with the ability to open the textbook to fill in any gaps you may encounter - with a lower risk of losing points for errors. This is the motivation for having each of you complete homework independently without any cross collaboration. By forcing each of you to answer questions independently, you demonstrate the degree to which you are prepared to answer questions asked on the spot (e.g. during an exam, or during a job interview) without the luxury of textbooks and Internet searches.

This independent understanding is still desired, but now that groups have been formed, I will allow homework to be completed and turned in as a group. This will allow you all to think critically about these questions, discuss it among yourselves, and come to a consensus on what your answers will be. Everybody within your group will share the same grade. However, you are not allowed to collaborate with other groups.

**No Handwritten Answers**

This homework will require some written responses and some diagrams. For the written responses, use a standard word processor like Microsoft Word, LibreOffice Writer, Google Docs, or LaTeX. Drawings can be made using Microsoft PowerPoint or Google Drawings, among others. You can explore other tools as well, just search around and verify the tool you are considering is compliant with the design aspects that are presented in class.

Please create your answers in a digital format, export to a PDF, upload that PDF to Canvas, and turn in a hard copy. Google Docs is especially convenient for real-time remote collaborative writing with your groupmates. For those of you considering LaTeX, ShareLaTeX and Overleaf are good online editors.

***Protip***: if you’re using Google Docs, you can create subscripts and superscripts by selecting a piece of text and pressing Ctrl + Comma or Ctrl + Period, respectively.

**One Problem per Page**

In the past, many students turned in a single piece of paper with all answered questions smooshed onto it. This did not leave my grader or I with adequate room to provide suggestions on how a design could be improved nor explanations on errors. The process of design work is to work in iterative stages: the first stage will be rather messy (and can be hand-written), the second stage will have things cleaned up, and so on. The final stage is what you should turn in, and it should be free of scratched-out work and high-density drawings.

Only answer one problem on *at least* one page, and refrain from super-compact answers that leaves more than 1/2 of the page empty. Ideally, leave somewhere between 1/4 to 1/2 of a page empty so that we can make annotations.

Finally, you don’t need to print off this page when turning in the hard copy.

|  |  |
| --- | --- |
| Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Lecture Section: \_\_\_\_\_\_\_\_\_\_\_  Group Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**CS 2300 – Homework Assignment 2**

Due: Thursday, Oct 4th at the start of class

Turn in a hard copy in class, and upload a PDF to Canvas

Total possible points: 65 points

1. The following update operations are applied to the database state from Figure 1 (on the next page), which has the relational schema shown in Figure 2. If there are any integrity violations, discuss which violations occur and why they occur, as well as remedial strategies that enforce these constraints. If an operation is executed successfully, assume the state of the relation is updated to reflect this.

a. Insert <‘Robert’, ‘F’, ‘Scott’, ‘943775543’, ‘1972-06-21’,

‘2365 Newcastle Rd, Bellaire, TX’, M, 58000, ‘888665555’, 1>

into EMPLOYEE.

b. Insert <‘ProductA’, 4, ‘Bellaire’, 2> into PROJECT.

c. Insert <‘Production’, 4, ‘943775543’, ‘2007-10-01’> into DEPARTMENT.

d. Insert <‘677678989’, NULL, ‘40.0’> into WORKS\_ON.

e. Insert <‘453453453’, ‘John’, ‘M’, ‘1990-12-12’, ‘spouse’> into DEPENDENT.

f. Delete the WORKS\_ON tuples with Essn = ‘333445555’.

g. Delete the EMPLOYEE tuple with Ssn = ‘987654321’.

h. Delete the PROJECT tuple with Pname = ‘ProductX’.

i. Modify the Mgr\_ssn and Mgr\_start\_date of the DEPARTMENT tuple with Dnumber = 5

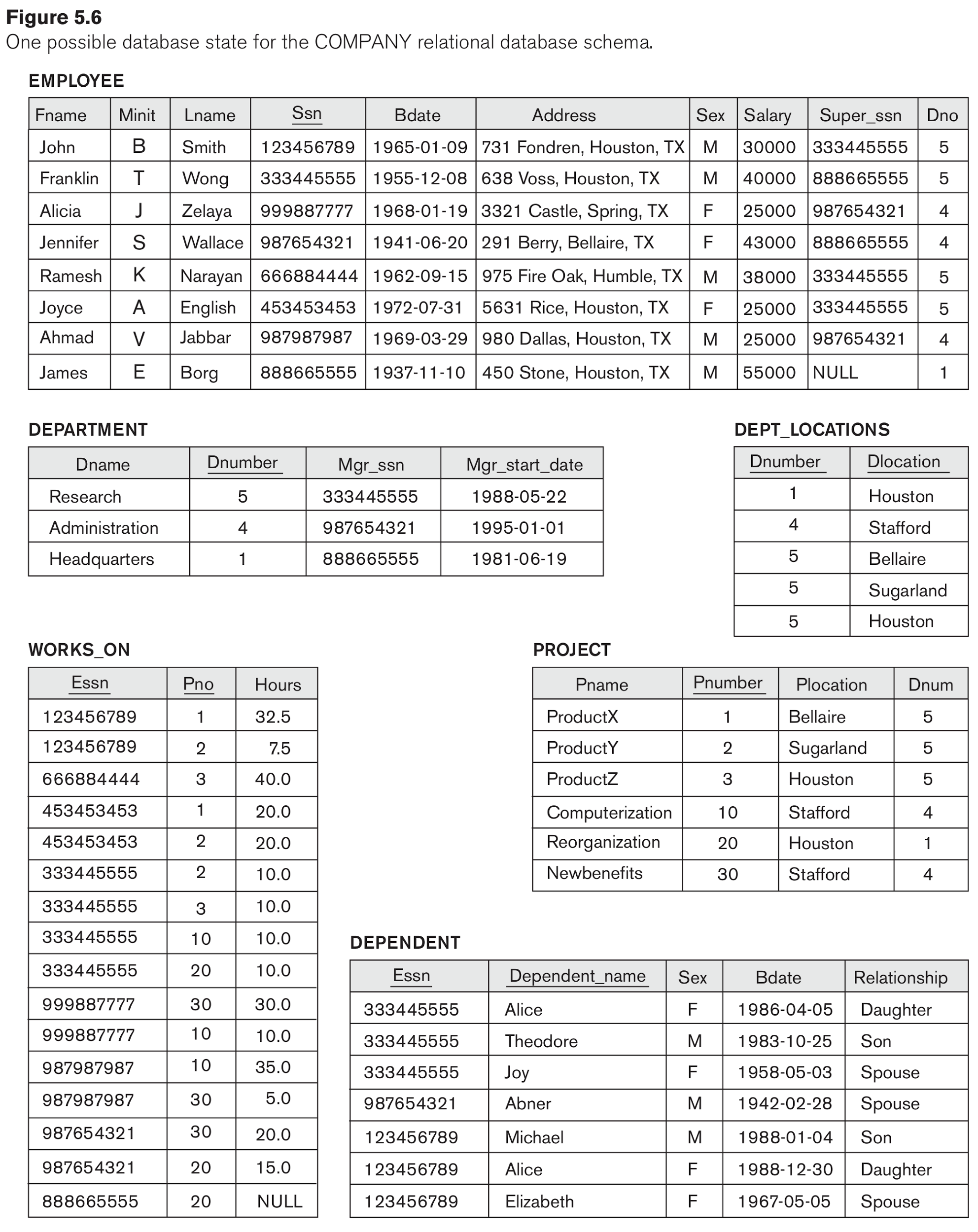
to ‘123456789’ and ‘2007-10-01’, respectively.

j. Modify the Super\_ssn attribute of the EMPLOYEE tuple with Ssn = ‘999887777’ to

‘943775543’.

k. Modify the Hours attribute of the WORKS\_ON tuple with Essn = ‘999887777’

and Pno = 10 to ‘5.0’.

**

**Figure 1.**

*Page left blank for Problem 1 answer. Use multiple pages if needed.*

2. Using the database schema in Figure 2, create relational algebra expressions using the relational operators discussed in class. Additionally, apply these queries to the database state in Figure 1 and show the resulting relation.

a. Retrieve the names of all employees in department 5 who work more

than 10 hours per week on the ProductX project.

b. List the names of all employees who have a dependent with the same first

name as themselves.

c. Find the names of all employees who are directly supervised by ‘Franklin

Wong’.

d. For each project, list the project name and the total hours per week (by all

employees) spent on that project.

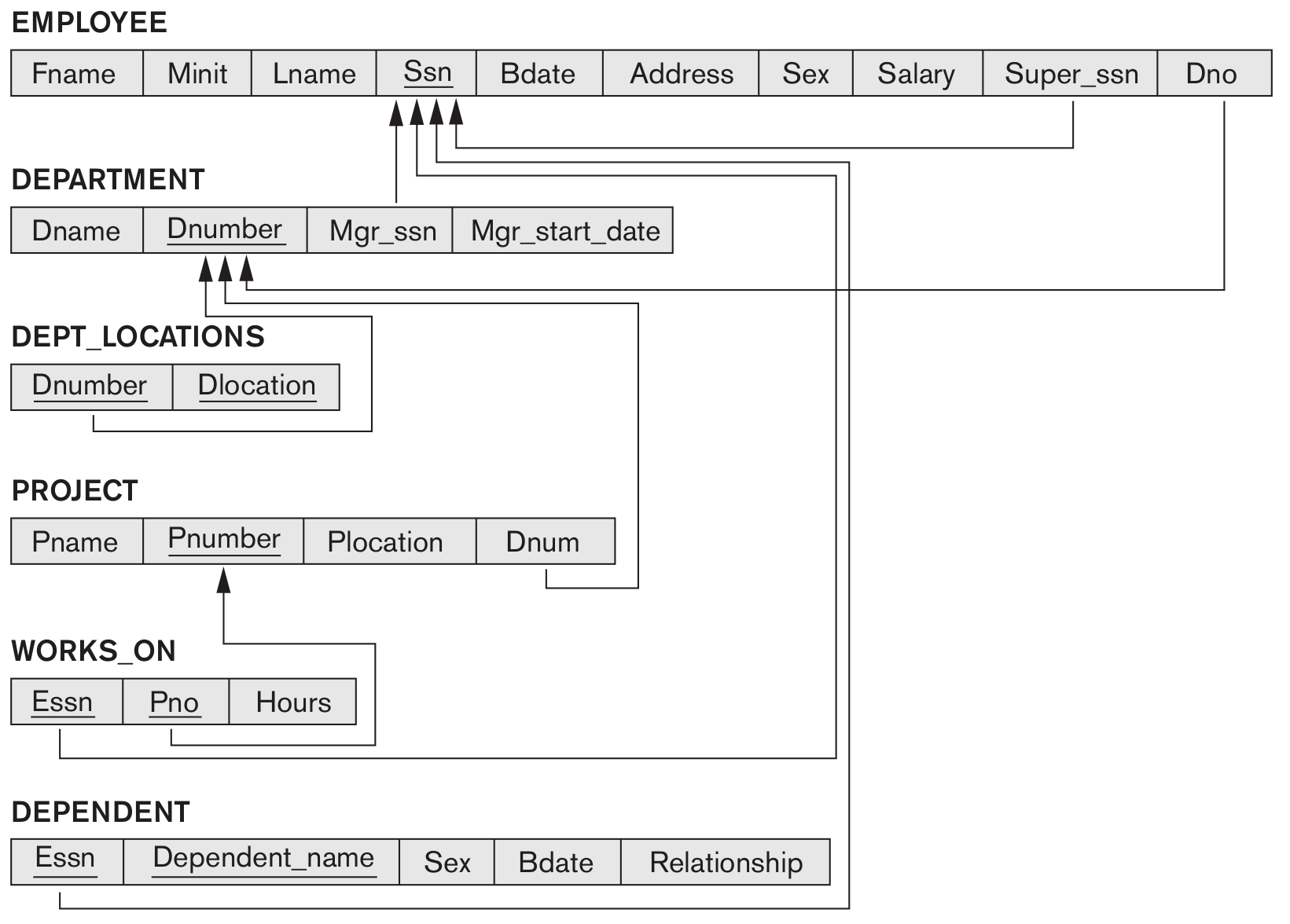
e. Retrieve the names of all employees who work on every project.

f. Retrieve the names of all employees who do not work on any project.

g. For each department, retrieve the department name and the average salary of

all employees working in that department.

h. Retrieve the average salary of all female employees.



**Figure 2.**

*Page left blank for Problem 2 answer. Use multiple pages if necessary.*

3. An order-processing database for a company may have the following six relations:

CUSTOMER (Cust#, Cname, City)

ORDER (Order#, Odate, Cust#, Ord\_Amt)

ORDER\_ITEM (Order#, Item#, Qty)

ITEM (Item#, Unit\_price)

SHIPMENT (Order#, Warehouse#, Ship\_date)

WAREHOUSE (Warehouse#, City)

where Ord\_Amt is the total spent on an order (in dollars); Odate refers to when an order was placed; Ship\_date refers when an order was shipped from a warehouse.

Assumption: an order can be shipped from multiple warehouses

Based on intuition, which of these attributes are foreign keys for this schema, and to which relation (and primary / candidate key) would each reference? Explicitly state any assumptions you make.