Q1 Key Terms (18 points)

Give a simple definition or an example for the following terms:

1. Referential Integrity

2. Primary Key

3. Foreign Key

4. Candidate Key

5. Strong and Weak Entity Type

6. Functional Dependency

Q2 Database Design (32 points)

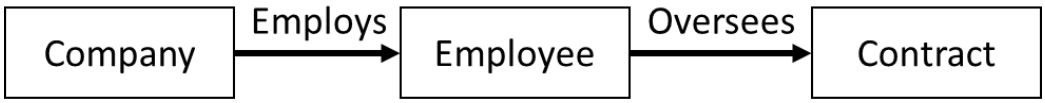
List 2 fact-finding techniques discussed in the class. For each, give 2 advantages and 2 disadvantages of this technique.

Technique	**Advantages**	**Disadvantages**
	1. 2.	1. 2.
	1. 2.	1. 2.

Q3 Data Model (30 points)

The following E-R diagrams each have traps (1 Fan, 1 Chasm). Note the trap and what a potential problem would be. Draw new E-R diagrams for each with the traps removed.

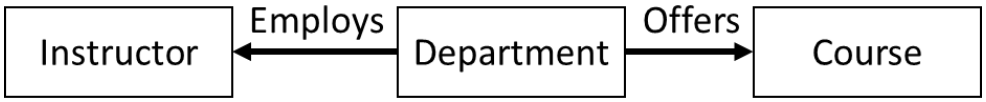
1. In this example, a company employs employees. When the company is awarded a contract, they will need to determine and assign an employee to oversee it. Hint: What if a contract has been awarded, but not yet assigned to an employee? What would be a problem?



Circle the type of Trap: Fan Chasm

Potential Problem:

2. In this example, a university department employs instructors to teach the courses it offers. Hint: How can we determine which course(s) an instructor teaches?



Circle the type of Trap: Fan Chasm

Potential Problem:

Q4 Normalization (40 points)

Beginning with the following un-normalized dataset in a relation called ProjectMembers, produce a 3NF version of the database with the same data. You must show the following:

1. Identify a Candidate Key for the ProjectMembers relation
2. Functional dependencies (For simplicity, you may use the lettered columns above the Column names for this part)
3. Identify transitive dependencies that exist
4. Identify any Candidate Keys, Primary Keys, and Foreign Keys in your final 3NF relations

ProjectMembers

A	B	C	D	E	F	G	H	I
Project ID	**Project Name**	**Project Manager ID**	**Project Manager Name**	**Company ID**	**Company Name**	**Employee ID**	**Employee Name**	**Hourly Rate**
PCS330	Database System	621	Joseph Ledet	123	AIU	331	John Smith	19
PCS330	Database System	621	Joseph Ledet	123	AIU	332	Kate Tucker	16
PCS330	Database System	621	Joseph Ledet	123	AIU	333	Tim Wylie	23
PCS201	Tax System	456	Can Muratoglu	457	Auburn	334	Jim Reynolds	15
PCS201	Tax System	456	Can Muratoglu	457	Auburn	335	Mehmet Dogan	18
PCS201	Tax System	456	Can Muratoglu	457	Auburn	336	Metin Gorur	22
PCS101	User Interface	789	Andy Bey	457	Auburn	337	Levent Yilmaz	18
PCS101	User Interface	789	Andy Bey	457	Auburn	338	Halit Oguztuzun	20
PCS101	User Interface	789	Andy Bey	457	Auburn	339	Alice Smith	21

Q5 E-R Diagram (40 points)

For the 3NF database **you produced** in the previous question, draw the E-R diagram. Include in your diagram each of the relations (entities) and the relationship along with participation/cardinality (i.e. 1..*, 0..1, etc.).

Q6 SQL (40 points)

Using the 3NF database **you produced** in the previous questions, produce SQL queries to do the following:

1. Identify how many employees work on Project PCS101.
2. Identify how many employees work for Auburn and have an hourly rate more than 20.
3. Move Levent Yilmaz from his current project to the "Tax System" project.
4. Remove John Smith from the Company AIU and his current project.
5. Add Mehmet Dogan to the User Interface Project (do not remove him from the Tax System Project)
6. Give privilege to select from one of your tables to all users.
7. Give privilege to remove records from one of your tables to a role called "Supervisor". Allow Supervisors to give this privilege to others.
8. Create a view that gives the Project ID, Project Name, and Manager Name for the project with the greatest average hourly rate (average hourly rate for a project is the average of the hourly rates of all the employees on the project).
9. Create a new table called OriginalData with the same columns as the original table.
10. Put the data into this table by using a select query that joins all of your 3NF tables. Hint: This will produce the original UNF table.