In this assignment you will explore database design using CIOM and EER to achieve a better understanding of conceptual schema design, as well as address key issues in conceptual modeling.

A property management company has approached you to build a system that will help it keep track of its properties, tenants, and employees. Consider the following requirements and design a database conceptual schema to support such an application. (for problems 1 and 2 below):

The property management company owns several buildings, each at a distinct address. Each of the buildings contains several apartments. All apartments in a given building are assigned an apartment number that is unique within that building (but not necessarily across different buildings). The system should keep track of the number of bedrooms and number of bathrooms that each apartment has.

The system also needs to handle different kinds of people. A person is identified by a unique SSN, and has a name consisting their first name and last name. Each person may have several phone numbers. People handled by the application fall into two disjoint categories: tenants and employees.

For each tenant, it is necessary to record their bank account number for the purposes of deducting their rent. The application also needs to store the name and phone number of their next-of-kin for contact purposes in case of an emergency.

For each employee, the application needs to keep track of their monthly salary. Employees can be managers or technicians (or both). Each manager has an office located in one of the apartments, and is in charge of managing at least one building. All buildings must have a manager. For technicians, the application should keep a record of their skills, which is one or more of the following: “carpentry”, “plumbing”, “electrical”.

To rent an apartment from the property management company, tenants must sign a lease agreement. A lease agreement is a formal contract by one or more tenants (as may be the case with roommates) to lease an apartment; it includes the start date and expected duration of occupation of the apartment, as well as the amounts for security deposit and monthly rent. The lease agreement is also countersigned by the manager in charge of the building, on behalf of the company.
Problem 1 (40 points)

Design a CIOM conceptual schema based on the above specification, which accurately captures as much of the semantics of the application as possible. You should use the notation given in lectures. Your diagram should indicate all relevant classes, subclasses, set operator classes, attributes, attribute value classes, inverse attributes, and cardinalities.

*You may make and state in writing reasonable assumptions if they are not provided in the specification.*

Problem 2 (40 points)

Design an EER conceptual schema based on the above specification, which accurately captures as much of the semantics of the application as possible. You should use the standard notation shown in the course textbook. Your EER diagram should include all relevant entities, attributes, relationships, cardinalities and specialization and generalization hierarchies.

*You may make and state in writing reasonable assumptions if they are not provided in the specification.*

Problem 3 (20 points)

This question is based upon the description on ontologies presented in selected reading 5 in the course outline [SR5].

Compare and contrast the features and expressive power of ontologies as described in [SR5] in relation to database conceptual modeling as embodied in CIOM.

*Your answer must fit on one page or less.*

Submission Instructions:

- Your submission must be prepared electronically. This means that all answers are to be typed in a word processor, and all diagrams generated using programs such as Microsoft PowerPoint, Microsoft Visio, Google Drawing, Adobe Illustrator, etc. Handwritten and/or hand-drawn solutions are not acceptable.
- For the written portion of this assignment, please use single line spacing and font size 12.
- This assignment is due before the class at the specified due date and time.
- On-campus students: Only hard-copy submissions are accepted for this assignment. Submissions will be collected at the beginning of class on the specified date.
- DEN students: Please follow DEN procedures for homework submission.
- Late submissions: procedures are outlined on the course website. Do not submit by email. There is a 20% deduction per day or part thereof, starting from the submission deadline.
- Note that you must complete all the assignments and take both exams in order to pass the course.

Discussion Board and Student Collaboration Policy

- You should work on this assignment individually and within the realm of the USC Academic Integrity Guidelines.
- We encourage you to discuss general issues related to this assignment with other students without revealing and/or hinting at any answers.
- A discussion board for this assignment is available on DEN's Blackboard system.
- Use the discussion board as your main resource to post questions related to the assignment.
- The TAs will participate in the discussions and answer questions on the board.
- Do not ask TAs homework-specific questions by email.
- The discussion boards are moderated, so your posts will not show up until after they have been approved. Please do not re-post the same message.
- Start your homework early. Although the discussion board will remain open until the assignment deadline, the TAs cannot guarantee that they will be able to answer any/all last minute questions posted less than 24 hours before the deadline.