

## Description

Design an enhanced entity–relationship diagram (EER) for an Online Auction database.

Consider an Online Auction database system in which members (buyers and sellers) participate in the sale of items. The data requirements for this system are summarized as follows:

- The online site has members. Every member is identified by a unique member number. For every member, we store e-mail address, name, password, home address, and phone number.
- All members are either a buyer or a seller or both. A buyer has a shipping address stored in the database. A seller has a bank account number and routing number stored in the database.
- Items are placed by a seller for sale and are identified by a unique item number assigned by the system. Items are also described by an item title, a description, starting bid price, bidding increment, the start date of the auction, and the end date of the auction.
- Items are also categorized based on a classification hierarchy (for example, a modem may be classified as COMPUTER → HARDWARE → MODEM). The number of levels of hierarchy is not fixed. For example, COMPUTER → HARDWARE → MODEM is 3 levels of hierarchy but Computer → Laptops → Windows Laptops → 14-inches → Touch Screen has 5 levels of hierarchy. (Hint: use a Category entity and a Recursive Relationship)
- Buyers make bids for items they are interested in. Bid price and time of bid are recorded. The bidder at the end of the auction with the highest bid price is declared the winner, and a transaction between buyer and seller may then proceed. Note: each buyer may place many bids on an item and at the end only one of the bids is considered as a winner bid. Hints: Bids can be a weak entity having two owners (two parents), Buyer and Item, and you may want to have an entity for Won-Transactions that you store only the bids that won the auction (Won-Transactions)
- The buyer and seller may write feedback regarding their completed transactions(Won-Transactions). Feedback contains a rating of the other party participating in the transaction (e.g. 1 to 10) and a comment text.

## Guidelines

1. Find Entities (look for nouns in database description. They are mostly entities). Note: In this lab, you are supposed to use specialization that is part of EER modeling.
2. Find attributes of entities (mostly nouns, adjectives, or adverbs for entities)
3. Attributes can be of 4 types. Use proper Chen's modeling notation for each type of attribute. Note: In this lab, not all types of attributes are needed. For example, there might not be a derived attribute in this lab.
  - Simple
  - Composite
  - Multi-valued
  - Derived
4. Find Key Attributes and show them on the diagram. Key attributes can be simple or composite attributes.
5. Find relationships (look for verbs in the database description. Use third person single verbs, for left-to-right or top-down reading direction )
6. Specify cardinality ratio of relationships (Maximum Cardinality)
7. Specify total and partial participations (Minimum Cardinality)

You may want to use Microsoft Word for drawing the ER-Diagram. Run MS Word, create a new document, Open Insert Menu, click Shapes, and click on New Drawing Canvas (at the bottom of the menu). When you created a new Drawing Canvas, click on it to activate it and then you can insert shapes (rectangle, diamond, connectors...). If you have not used this feature of MS Word, it is recommended to use and draw your ERD to learn this skill for your future projects. There are many videos on YouTube or other resources to learn how to use drawing Canvas in MS Word (e.g. <https://www.youtube.com/watch?v=PYdgEdG7kpM>)

**Submission**

For this lab, you must submit a PDF or an image file (JPG/PNG) of your EER Model to the assigned folder on D2L prior to the due time. If you used a software other than MS Word, make sure to submit a file format that is well-known, and marker/instructor can open your file. Rename the file as lab#\_xy where # is the lab number, and x is your first name, and y is your last name.

**Marking Guide**

Task		Points	Granted	Comment
Entities	Strong	8		
	Weak	10		
Specialization		8		
Attributes		8		
Keys for entities specified		10		
Relationships	Binary/N-ary	7		
	Recursive	8		
	Identifying	7		
Cardinality ratio of relationships		12		
Total and partial participations		12		
ERD drawn by a software		10		
Total		100		