**E-R Model Rational**

Most of the entities are related to each other through the Auction relationship. An Auction has an ItemID, BuyerID, SellerID, and EmployeeID among other attributes. Whichever Item populating ItemID is the one being sold in the auction. Whichever Invoice populates InvoiceID is the invoice that the Auction has created. An Employee manages an Auction, and we will know which Employee is the one managing the Auction by EmployeeID. An Employee is either a Customer-Representative or a Manager so the diagram shows this.

Employee, Customer, and Item do not have AuctionID as an attribute because we can get all the information about who/what is participating in Auction by the Auction fields. However, Invoice has AuctionID for the times when we want to use the Invoice table to get information about the Auction.

Not every Item participates in an Auction, not every Employee participates in an auction, but every Seller and every Buyer participate in at least one Auction, so we have specified a participation constraint. Also, every Invoice participates in exactly one Auction, so there is a participation and key constraint.

A Customer IsA Seller and IsA Buyer because each Customer can participate in an Auction as a Seller but can participate in an Auction as a Buyer. A Customer is not restricted to always being a Seller or always being a Buyer. Neither Seller nor Buyer have any attributes, but we believed we should make them entities to show that an Auction has both a SellerID and a BuyerID.

A User IsA Employee and IsA Customer because every Employee and every Customer are entered into the system as a User. Neither Customer nor Employee has a UserID attribute because UserID has UserType and UserID as primary keys, and when we want to access User information about a Customer, then we can search the User table by using a query that looks like “select \* from User, Customer where UserType = ‘Customer’ and UserID = Customer.CustomerID”. The same idea applies for Employee.

The Bid table is disjoint because Bid serves as a table to store the bid history of an Auction. We can access the corresponding Auction by the AuctionID attribute. Bid also has BuyerID as an attribute to tell us which Customer (acting as a Buyer) placed the Bid.