Computer Science 321
Database Systems
Fall 2003

HW 1 Due: September 17, 2003 Total weight: 100 pts.

1. [100*pts*] You have been hired to develop a database for the newly-created VaRail railroad company.

   VaRail will own various *stations* in Virginia *cities* and various *tracks* of certain *length* that will *connect* these stations.

   VaRail will also own many (railroad) *cars*, which have sets of *seats*, and *locomotives*. Cars and locomotives can be assembled as needed to form *trains*. Of course, a train goes from one station to another over one track and, at every station where it *stops*, cars that are at that station might be added to it, and cars in the current train may be removed from it, so it is important to know at which station each idle car currently resides.

   Cars and locomotives have some *gross weight*, and the total weight of a train, which is formed by a locomotive plus zero or more cars, must not exceed the *maximum weight* that the locomotive is able to move.

   Customers, for which we need to know a *name* and a *phone number*, can make *reservations* to travel between stations A reservation is for a particular seat of a particular car of a particular train.

   Define an Entity-Relationship schema for the VaRail database (you might want to define some attributes which I did not mention here, but don't go overboard). If you feel you need to make some assumption, do so, but document your assumption in writing. Discuss and justify your choices in deciding what is an attribute, a relationship, or an entity. Analogously, discuss what are the key and participation constraints.

   Also discuss any logical constraint that the data in your database should satisfy but is not captured by your ER schema (of course, the fewer the better!).