1.) EER

A TV, a VCR, and a Stereo are all Entertainment Appliances. TVs have screen sizes, VCRs have number of heads, and Stereos have maximum decibel levels. All entertainment appliances have a unique serial number, are manufactured by a specific company and may Integrate/Be Integrated With any number of other entertainment appliances. Additionally TVs and Stereos may be Registered Devices which are Registered to one and only one Person. A person has a number and may have an unlimited number of registered devices.

a.) Represent each Concept above as an entity, relationship, or category within an EER diagram using the layout friendly notation of chapter 2.

b.) Map the resulting EER diagram to a set of tables using the algorithm of chapter 2.

c.) Discuss whether or not SQL is able to enforce all the constraints specified in your EER diagram.

2.) Temporal Databases

Sale(S#, Cust, Item, Price, Date, TST, TET)

001, Stinky, A-XT, $1,200, 06-23-89, 06-23-89, uc
...

In SQL (or Datalog if you wish):

a.) Give the sales that did not get revised in any way.

b.) Give the sales that had a price revised downward.

c.) Give the sales that were canceled.

d.) Show the relevant tuples after we update the name 'Stinky' to the name 'Corn Fed' on 01-01-93.

3.) Datalog Queries

Consider the following schema:

SubParts(Part#, subParts)
Description(Part#, Description)
ManufacturedBy(Part#, Company)

With an example EDB:

SubParts(001, {002,003})
Description(001, 'Motor Rocket')
ManufacturedBy(001, 'King Weasel Inc.')
Description(002, 'Tin Barrel')
ManufacturedBy(002, 'King Weasel Inc.')
Description(003, 'Duster Motor')
ManufacturedBy(003,'Sappy Co.'
a.) define the IDB predicate `subPart(Part, SubPart)` which flattens the `SubParts` relation.

b.) define the IDB predicate `within(Part, SubPart)` which is true when `SubPart` is somewhere within `Part`.

c.) define the IDB predicate `soleyManufacturedBy(Part, Company)`.

4.) XML

a.) Define a DTD corresponding to the schema in problem 3.

b.) Create a document of this DTD type that captures the database state depicted in problem 3.

5.) Data Cubes

Consider the cube for death statistics in the city of New York for 1995:

`NumberOfDeaths(AgePool, Gender, Month, Cause)`

*AgePool* #1,#2,#3, etc. represent ages 0-5, 5-10, 10-15, etc. *Gender* is ‘male’ or ‘female’. *Month* is the month name, *cause* is one of a set of 18 descriptors (10 diseases, 5 accident, and 3 homicides types). Furthermore, months are grouped in seasons of fall, winter, spring and summer, age pools are grouped into children, teenagers, young adults, etc. and *cause* is grouped by type.

a.) Define a star schema that holds this data in a ROLAP system.

b.) Define a snowflake schema that holds this data in a ROLAP system.

c.) Write an SQL query (over the schema in b) that returns the number of deaths by heart disease over the summer months for young adults grouped by gender.

6.) Possible Worlds

Consider the schema:

`Visits(Person, City)`

`LivesIn(Person, City)`

Where *Person* is from the set {mike, dave, jon, pat, eric} and *city* is from the set {LA, Detroit, Chicago}.

a.) How many distinct databases may be constructed over the schema with these constants?

b.) Now consider the “integrity constraint” that a person may only visit and/or live in at most one city. How many states now?

c.) Finally, under the constraints in b, consider if we have the inclusion dependency that `LivesIn \subseteq Visits`. How many possible database states now?
7.) Essay

Describe an application of advanced databases that you think would be interesting. Be creative and write at least 1 full page.