CS 448/648 Assignment #1

Assignments may be done individually or in teams of two.

Due by 10:00 am on Friday, January 26, 2001.

1. Using **(a)** relational algebra, **(b)** tuple relational calculus, and **(c)** QBE, answer queries 2, 4, 6, 8, and 10 of question 4.5 from Ramakrishnan and Gehrke's text.
2. Translate queries 1, 3, and 5 from question 4.4 in Ramakrishnan and Gehrke's text into **(a)** tuple relational calculus and **(b)** QBE.
3. Consider the relational database used in the course notes (see Slides 2-5 and 2-7). Translate the following queries on that database into relational algebra:

   (a) $\{\, t \mid \exists e\, (e \in \text{Emp} \land t[\text{Ename}] = e[\text{Ename}] \land$
   $\exists w\, (w \in \text{Works} \land t[\text{Resp}] = w[\text{Resp}] \land e[\text{Eno}] = w[\text{Eno}] \land w[\text{Dur}] > 12)) \}$

   (b) $\{\, <p,r> \mid \exists n,b\, (<n,p,b> \in \text{Proj} \land \exists e,d\, (<e,n,r,d> \in \text{Works}$
   $\land (d > 12 \land b > 200000))) \}$

   (c) $\{\, t \mid \exists p\, (p \in \text{Proj} \land t[\text{Pname}] = p[\text{Pname}] \land$
   $\exists e\, (e \in \text{Emp} \land t[\text{Ename}] = e[\text{Ename}] \land$
   $\exists w\, (w \in \text{Works} \land w[\text{Pno}] = p[\text{Pno}] \land w[\text{Eno}] = e[\text{Eno}] \land$
   $\forall v\, ((v \in \text{Works} \land v[\text{Resp}] = w[\text{Resp}]) \Rightarrow v[\text{Dur}] \le w[\text{Dur}])))) \}$

4. **(a)** Use an Entity-Relationship Diagram to depict the following enterprise. Explain any additional assumptions you make and list any aspects you were not able to depict.
   - A TV program, identified by name, has a genre (comedy, news, etc.), an intended audience (children, teens, etc.), and a rating.
   - An actor/actress, identified by name, has a date of birth and a sex.
   - Similarly, a director, who may or may not be an actor/actress is identified by name and has a date of birth and a sex.
   - If a TV channel, identified by number, is independently owned (i.e., it is not part of a network such as CBC or NBC), then it has an owner and a city. Otherwise it has a network affiliation and a city.
   - Some actors/actresses have exclusive contracts with one network (such as CBC or NBC).
   - A TV program can appear in one or more time slots on one or more channels (including several time slots on one channel or several channels at one time).
   - Each TV program has exactly one director.
   - An actor/actress can star in one or more TV programs, and arbitrarily many actors and actresses can star in a TV program.

   (b) Design a corresponding relational database. For each relation, give the primary key, list any foreign keys, and describe any other constraints that should be captured to match your design from part **(a)**.