HOMEWORK 1

Part 1

1. Give 3 examples of transactions, other than an ATM bank withdrawal, in which a real-world event occurs if and only if the transaction commits.

2. State 3 possible integrity constraints for the database in an airline reservation system.

3. The schema of the Student Registration System includes the number of current registrants and a list of registered students in each course.
   (a) What integrity constraint relates this data?
   (b) How might a registration transaction that is not atomic violates this constraint?
   (c) Suppose the system also implements a transaction that displays the current information about a course. Give a non-isolated schedule in which the transaction displays inconsistent information.

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Part 2

1. Let $S = \{\emptyset, a, b\}$ and $T = \{(1, 5), 2, 3\}$.
   (a) What are $|S|$ and $|T|$ equal to?
   (b) How many subsets does $T$ have? Why?
   (c) List all the subsets of $T$.
   (d) Compute $S \times T$?
   (e) Compute $T \times S$?
   (f) Is $A \times B = B \times A$ for all sets $A$ and $B$? Why?
   (g) What are $|S \times T|$ and $|T \times T|$ equal to?
   (h) Is $|A \times B| = |B \times A|$ for all sets $A$ and $B$? Why?
   (i) Define a relation from $S$ to $T$ by a set.
   (j) How many relation from $S$ to $S$ are there? Why?

2. Consider the relation $Loan$.
   Represent the relation $Loan$ by a table.
   Note: A line in the table means: “The loan number $x$ is of amount $y$ and was made on the date $d$".
Part 3

1. Cardinality:
   
   (a) The Tiny College administration limits the professor to teaching a maximum of 3 classes per semester. If Tiny College has research professorships, a professor may not teach any class at all.

   What is the cardinality of the relationship type *Teaches* between the entity types *Professor* and *Class*? Explain. Draw the E-R diagram.

   (b) The tiny College administration limits also a student to a maximum of 6 classes a semester and class size are limited to 35 student.

   What is the cardinality of the relationship type *EnrollsIn* between the entity types *Student* and *Class*? Explain. Draw the E-R diagram.

2. 
   - Draw the E-R diagram associated to the following specification.
     
     You must show all the steps that make you achieve your final E-R diagram (entity types, attributes, relationship types, cardinalities, IsA, covering and disjoint constraints...)

   - Authors (entity type *Person*) submit documents (entity type *manuscript*) to editors for publication. Editors might refuse the manuscript immediately or submit the manuscript to referees (relationship type *Examination*). Referees give their opinion (attributes *opinion* and *date Opinion*). If referees give good reports, editors can decide to produce the manuscript as a book (entity type *Book* and relationship type *edition*).