CS3431: Project Description
B-term, 2011
Homework 2: Relational Model & Relational Algebra

Due Date: Nov. 15, 2011 (8:00 AM).

General Instructions

- The homework is to be done individually.
- Any assumptions you make, which are not stated in the problem definition, need to written explicitly. The assumptions you add must be "***in addition***" to the specified requirements in the problem definition without deleting any of the given requirements.

Problem 1 (Map ERD to Relational Model) [25 Points]

Map the ERD given in Figure 1, to the corresponding relational model. The ERD is a representation of a ***book database*** that captures the relationships between "books", "publishers", and "authors". This ER diagram meets the requirements given in Problem 1, Homework 1.

You should follow the refinement rules given the class while generating the relational model. In the relational model, you should provide:

- A list of CREATE TABLE commands to create the required tables. In each command include the column names, and the data types (you should choose an appropriate type for each column).
- Include all integrity constraints such as primary keys, unique keys, foreign keys, domain constraints, NOT NULL, etc. Either includes the constraints in the CREATE TABLE command, or using separate ALTER TABLE commands.
- Indicate any assumptions you make while doing the mapping. For example, for the ISA relationship, there are several ways to map it to the relational model, you should state the motivation of your choice and why do you think it is a good choice.

Problem 2 (Relational Algebra) [20 Points (5 Points each query)]

Given the relational model that you will build in Problem 1, provide the algebraic expression corresponding the following queries:

Q1: Report the book titles and ISBN for the books written by author named "John Smith".

Q2: Report the names and addresses of the authors and publishers who have contracts between "Jan-01-2007" and "Dec-31-2008" with total payment above $100,000. Also report the contract date.

Q3: Report the publisher name that have published more than 10 books.

Q4: Report the contracts (the author ID, publisher Name, and contract date) that have the sum of "partial payments" of the contact lines does not match the "total payment" defined in the contract.

Problem 3 (Relational Algebra) [15 Points (5 Points each)]

Suppose relations R and S have ***n*** tuples and ***m*** tuples, respectively. Calculate the lower (minimum) and upper (maximum) bounds on the numbers of tuples that the following expressions can produce:

1. $R \bowtie S$

2. $\sigma_p(R) \times S$, for some predicate ***p*** and assume $\varnothing \times S = S$, where $\varnothing$ is an empty relation.

3. $\Pi_l (P) - Q$, for some list of attributes ***l,*** and assume that the difference operation is valid.

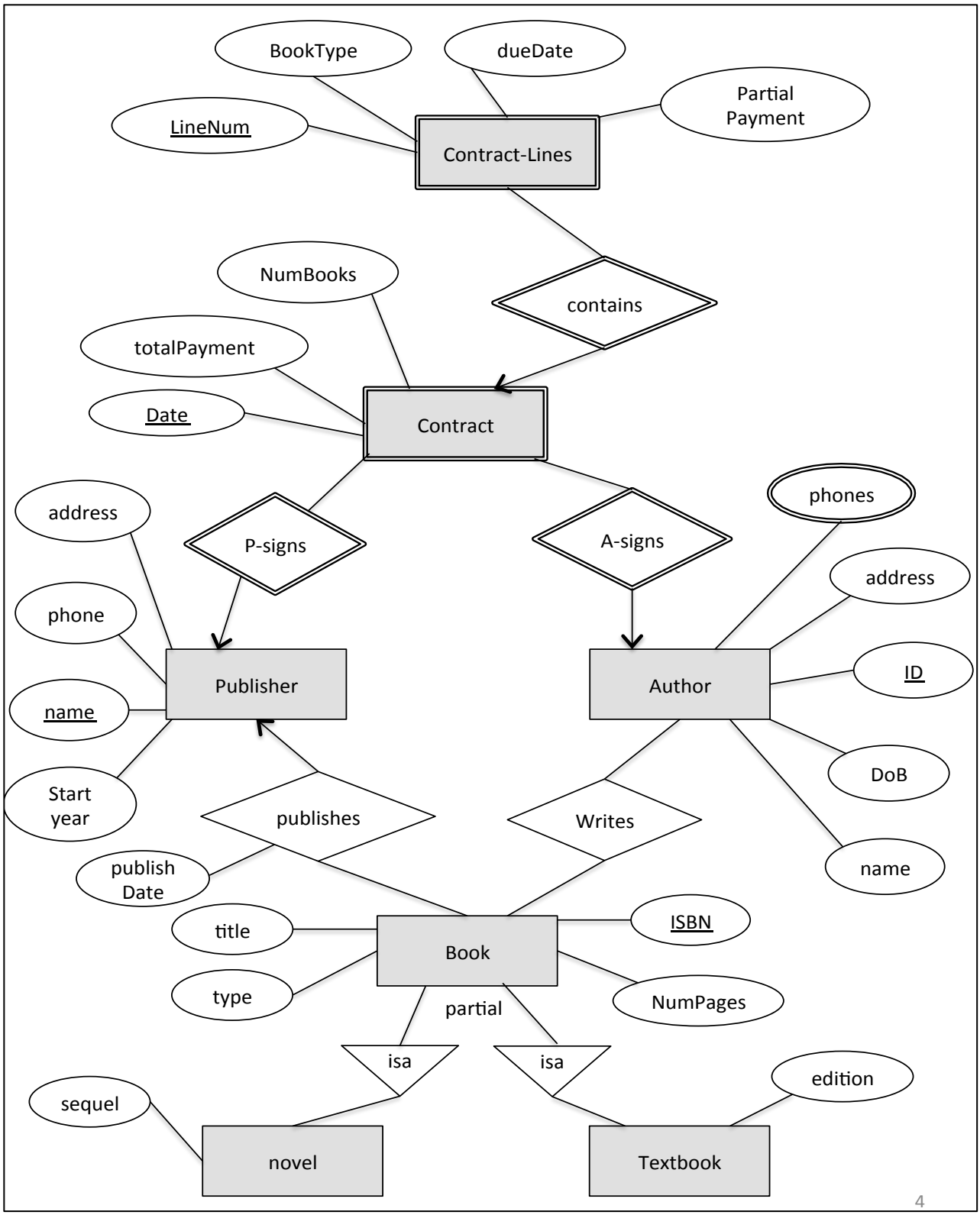
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Figure 1

Grading:
The maximum grade is 60 Points. Late submissions follow the rules stated on the website.

Deliverables:
Each student should deliver a report containing the required solution.

Submission:
Submit a hardcopy in the beginning of the class (8:00AM), or submit electronically via blackboard.wpi.edu website.