

CMPS 340 Intro to Database

Fall 2017

HW #1 : Relationship Constraints and ER Modeling

Due: 1pm, September 6

1. (a) Suppose that A and B are entity types having (at some moment in time) associated entity sets $\{a_1, a_2, a_3\}$ and $\{b_1, b_2, b_3, b_4\}$, respectively. Suppose also that there exist binary relationship types R_1 through R_6 involving A and B . The corresponding relationship sets (at the same moment in time) are given in parts (a) through (f). For each one, you are to indicate the *strongest* cardinality ratio constraint and the *strongest* participation constraint (with respect to each of A and B) with which it is consistent (i.e., that it does not violate). For each problem, then, your answer should be a member of the set

$$\{1:1, 1:N, N:1, M:N\} \times \{\text{total, partial}\} \times \{\text{total, partial}\}$$

For example, the answer (1:N, total, partial) would indicate that the given relationship set satisfied the 1:N cardinality ratio constraint but not the (stronger) 1:1 constraint, that participation of A was consistent with the total participation constraint, and that participation of B was consistent with the **partial participation** constraint (which is really no constraint at all) but not consistent with the (stronger) **total participation** constraint.

- (i) Relationship set of R_1 : $\{(a_1, b_2), (a_2, b_3), (a_2, b_4), (a_3, b_3)\}$
- (ii) Relationship set of R_2 : $\{(a_1, b_2), (a_1, b_4), (a_3, b_1), (a_3, b_3)\}$
- (iii) Relationship set of R_3 : $\{(a_3, b_1)\}$
- (iv) Relationship set of R_4 : $\{(a_1, b_1), (a_1, b_2), (a_2, b_1), (a_2, b_3), (a_2, b_4), (a_3, b_3)\}$
- (v) Relationship set of R_5 : $\{(a_1, b_3), (a_2, b_3)\}$
- (vi) Relationship set of R_6 : $\{(a_1, b_4), (a_2, b_2), (a_2, b_3), (a_3, b_3)\}$

(b) Devise a relationship set (for a binary relationship type involving A and B , as above) for which the correct answer (to the question repeatedly posed in the problem above) is (N:1, total, partial).

(c) The set of possible answers for each of parts (a) through (f) of problem 1 has sixteen elements ($4 \cdot 2 \cdot 2$, corresponding to the product of the number of choices for each component). Five of the sixteen are impossible, given our choice of entity sets, namely $\{a_1, a_2, a_3\}$ for A and $\{b_1, b_2, b_3, b_4\}$ for B . Identify three of the impossible answers and, for each one, tell why it is impossible.

2. Design an ER schema diagram like that in Figure 3.2 of Elmasri & Navathe (7th edition; Figure 7.2 in 6th edition) for the following set of requirements pertaining to a TV Series database application. The types of entities involved include **TV Series**, **Character**, **Actor**, and **Episode**, and possibly others.

Each TV series:

- has a title that, in combination with the ID of its main creator (e.g., Rod Serling), uniquely identifies it
- is categorized as being in one or more genres (e.g., comedy, drama, talk show)
- has an associated collection of episodes

Each character:

- has a name that, in combination with the TV series in which (s)he first appeared, uniquely identifies her/him (or “it” in the case of a genderless monster).
- appeared in one or more episodes of at least one TV Series, including the one in which (s)he first appeared.

Each actor:

- has a “stage” name (e.g., John Wayne) that, in combination with her/his date of birth, uniquely identifies her/him.
- has a “real” name (e.g., Marion Morrison)
- has played various characters

Each episode:

- has a title that, in combination with the TV series of which it is an instance, uniquely identifies it
- first aired on some particular date

Make sure to indicate (using the diagrammatic conventions shown in Figure 3.14 (7.14 in the 6th edition) and used in Figure 3.2 (7.2))

- which are the *strong* and which are the *weak* entity types
- key attribute(s) of each strong entity type
- partial key attribute(s) of each weak entity type
- which are the regular and which are the *identifying* relationship types
- for each relationship type, to which constraints (of the *cardinality ratio* and *participation* varieties) it must conform

Note any assumptions you made to fill in missing requirements or to clarify existing ones. Note any (conditions specified within the) requirements that cannot be expressed by the ER schema diagram notation.