**IS 441 Brief Review for Exam 1**

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**Part I: Business Rule and ER Diagram**

1. Business rule:

a. a relationship must have two rules, one presents the logic from each direction;

b. a rule begins with “each” or “a/an”;

c. before both rules are stated, one cannot determine the cardinality of a relationship.

2. ERD and business rules must have “one-to-one correspondence”, i.e.,

- what is stated in rules must be reflected in ERD;

- what is NOT in rules must NOT be added to ERD.

3. Notations of relationship verb and cardinality:

Logic example:

Each instance of entity A may be associated with multiple instances of entity B,

Each instance of entity B must be associated with one instance of entity A 🡺

A 1-M between A and B, where A is on 1-side and B on M-side.

**B**

**A**

Business correspondence:

Each FACULTY member may teach multiple COURSEs,

Each COURSE must be taught by one and only one FACULTY member 🡺

A 1-M between FACULTY and COURSE, where FACULTY is on 1-side and COURSE on M-side.

Teach

**CORS**

**FAC**

The “Anatomy”:

1 FAC member 🡪 Teach ------------🡪 (maybe) M COURSE **Logic departs** from **left**, **cardinality** at **right**

Must be by 1 FAC 🡨 ------------ is taught by 🡨-- 1 COURSE, **Logic departs from R**, **cardinality at L**

4. Cardinality statements:

Optional one: may have one; at most one;

Mandatory one: must be one and only one;

Optional many: may be many, but does not have to (verb) any;

Mandatory many: at least one; may be any number but cannot be zero/none.

**5. Time change of cardinality:**

in the long run, optional would become mandatory, and one could become many

**Part II: ER Diagram – Associative Entity, and Unary Relationship**

1. Associative entity:

a. Condition: M-N relationship, having attributes for the relationship;

b. Entity notation: rounded-corner rectangle;

c. Key: taken from the entities at both ends of the associative entity (the two entities in the old M-N relationship); [If B has key Kb and C has key Kc, then associative entity has key Ka = Kb + Kc]

d. Cardinality – 1: MUST have mandatory one on both of the “far ends”, as indicated below:

**A**

**C**

**B**

 MUST have “M” (“crow’s foot”) on the near ends

The (maybe) different M-cardinalities are to maintain the “views” from the eyes of the “logic starter” – where the logic begins:

**B**

**C**

“B sees optional M, then after the introduction of associative entity A, B still sees optional M;

C sees mandatory M, then after the introduction of associative entity A, C still sees mandatory M”

2. Unary relationship; distinguish ERD and relational model

a. Unary means: \*some\* rows of THE table may be associated with \*some\* **OTHER** rows in THE SAME table – but rows will NEVER relate to themselves.

“Box” = entity

b. Examples:

Unary 1-1: Marriage; Team standing (behind one other);

Unary 1-M: Manage relationship in EMPLOYEE table;

Unary M-N: TEAM plays each other TEAM, once in home game and once in away game.

c. Distinguishing unary in ERD and in relational model:

In relational model, the arrow indicating referential integrity always goes from Foreign key (a box) to primary key (ANOTHER box) – can NEVER circle through a box itself, because in this case “A BOX” means a filed, and a field cannot be PK and FK simultaneously:
Figure on right: “One box points to ANOTHER box”.

Box=field

**Part III: Relational Model**

1. Notation: A relation (table) is converted from an entity in ERD; a “box” is a field/attribute; referential integrity arrow leaves the foreign key and ends at primary key. 🡸 Watch direction! ! !

2. Referential integrity: Presented as an arrow leaving foreign key and arriving at primary key; the ref int arrow always leaves the relation on M-side and ends at the relation on 1-side.

3. (Continued from and based on the above point)

Associative entity is ALWAYS on M-side, so the “intersection” or “composite” relation/table it converts to, is always on M-side and thus has the referential integrity reference (PK-FK arrows) going OUT from the “intersection” or “composite” relation/table and pointing at another table/relation’s PK.

3. Recursive foreign key: See Part II, 2 c.

4. To check the consistency of relational model with its “root” ER diagram:

a. an entity in ERD is in *i* number of M-side of a relationship, then after converted to relational model, this relation/table would have *i* foreign keys with arrows going out;

b. an entity in ERD is in *k* number of 1-side of a relationship, then after converted to relational model, this relation/table would have *k* arrows coming in to point at its primary key;

c. by counting all the “supposed to be” outgoing and incoming arrows, you can make sure that your conversion of ERD to relational model is correct.