**Chapter 4 - Review Questions**

**1. What two conditions must be met before an entity can be classified as a weak entity? Give an example of a weak entity.**

* To be classified as a weak entity, two conditions must be met:
  1. The entity must be existence-dependent on its parent entity.
  2. The entity must inherit at least part of its primary key from its parent entity.

One example of a weak entity would be the CLASS entity from its COURSE. A CLASS entity is existence-dependent on COURSE because you can’t have a database CLASS unless a database COURSE exists.

**5. Suppose you are working within the framework of the conceptual model in Figure Q4.5:**

1. **Write the business rules that are reflected in it.**
2. **Identify all of the cardinalities.**
3. The business rules based on the conceptual model in Figure Q4.5 would be :
   1. A customer can own many cars.
   2. Some customers do not own cars.
   3. A car is owned by one and only one customer.
   4. A car may generate one or more maintenance records.
   5. Each maintenance record is generated by one and only one car.
   6. Some cars have not yet generated a maintenance procedure.
   7. Each maintenance procedure can use many parts.
   8. A part may be used in many maintenance records.
   9. Each maintenance procedure generates one or more maintenance files.
   10. Each part may appear in many maintenance lines.
4. The conceptual model in Figure Q4.5 does not shown cardinalities directly. Instead, the cardinalities are implied through the Crow’s Foot symbols. One might write the cardinality (0,N) next to the MAINT\_LINE entity in its relationship with the PART entity to indicate that a part might occur “N” times in the maintenance line entity or that it might never show up in the maintenance line entity.

**7. How would you (graphically) identify each of the following ERM components in a Crow’s Foot notation?**

1. **An entity**
2. **The cardinality (0,N)**
3. **A weak relationship**
4. **A strong relationship**
5. An entity is represented by a rectangle containing the entity name. A composite entity is defined by the fact that at least one of the PK attributes is also a foreign key. Therefore, the Crow’s Foot ERD’s composite and weak entities are not differentiated.
6. Cardinalities are implied through the use of Crow’s Foot symbols. *(See Crow’s Foot graphic)*
7. A weak relationship exists when the PK of the related entity does not contain at least one of the PK attributes of the parent entity. For example, if the PK of a COURSE entity is CRS\_CODE and the PK of the related CLASS entity is CLASS\_CODE, the relationship between COURSE and CLASS is weak. A weak relationship is indicated by a dashed line in the ERD.
8. A strong relationship exists when the PK of the related entity contains at least one of the PK attributes of the parent entity. For example, if the PK of a COURSE entity is CRS\_CODE and the PK of the related CLASS entity is CRS\_CODE + CLASS\_SECTION, the relationship between COURSE and CLASS is strong. A strong relationship is indicated by a solid line the ERD.

This graphic should illustrate an entity, cardinality (0,N), weak relationship and strong relationship.

**A strong relationship**

**A weak relationship**

**Crow’s Foot connectivity symbol, implied (0,N) cardinality**

|  |
| --- |
| STUDENT |
| **STU\_NUM (PK)** |
| STU\_LNAME |
| STU\_FNAME |
| STU\_INITIAL |
| DEPT\_CODE (PK) |

**Crow’s Foot Entity Box**

**9. What two courses of action are available to a designer encountering a multivalued attribute?**

* The designer can split the multivalued attributes into its components and keep these components in the same entity. The designer may also create a new entity composed of the multivalued attribute’s components and link this new entity to the entity in which the multivalued attributes occurred originally. The second option is mostly desirable when the number of outcomes in the multivalued attribute is unlimited. For example, employees classified as “technical” may have certifications in many different areas and at many different levels.

**Chapter 4 – Problems**

**3. Use the following business rules to create a Crow’s Foot ERD. Write all appropriate connectivities and cardinalities in the ERD.**

1. **A department employs many employees, but each employee is employed by one department.**
2. **Some employees, known as “rovers”, are not assigned to any department.**
3. **A division operated many departments, but each department is operated by one division.**
4. **An employee may be assigned many projects, and a project may have many employees assigned to it.**
5. **A project must have at least one employee assigned to it.**
6. **One of the employees manages each department, and each department is managed by only one employee.**
7. **One of the employees runs each division, and each division is run by only one employee.**

The following ERD shows the answers a through g:

PROJECT

ASSIGN\_TO

O

+

O

+

FK1

PK

emp\_no

div\_no

PK

dept\_no

FK1

FK2

div\_no

emp\_no

FK1

PK

dept\_no

emp\_no

proj\_no

emp\_no

proj\_no

PK, FK1

PK, FK2

PK

proj\_assign

emp\_assign

manages

employs

runs

operates

O

+

DEPARTMENT

EMPLOYEE

DIVISION