IDS 521 – Spring 2020

Assignment #1

To do this assignment, you may form a group of up to two students

Assigned date: January 18, 2020 **Due date: February 1, 2020**

Consider the following three figures. Figure 1 is an example of an Entity Relationship diagram for a simple university database using a Key Constraint notation similar to the one that we discussed in class. Figure 2 is an equivalent Entity Relationship diagram using a Crow's Foot notation. Figure 3 is a Relational schema based on either Figure 1 or Figure 2.

Figure 1: Entity Relationship Diagram with Key Constraint Notation

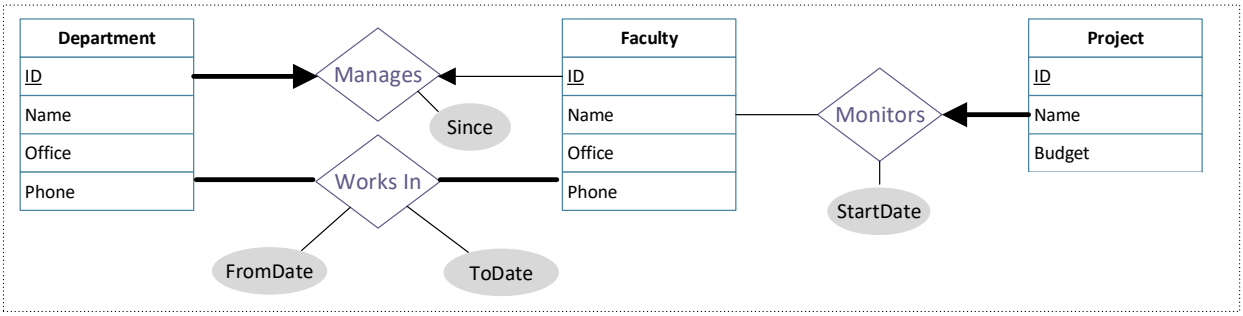


Figure 2: Entity Relationship Diagram using Crow's Foot Notation

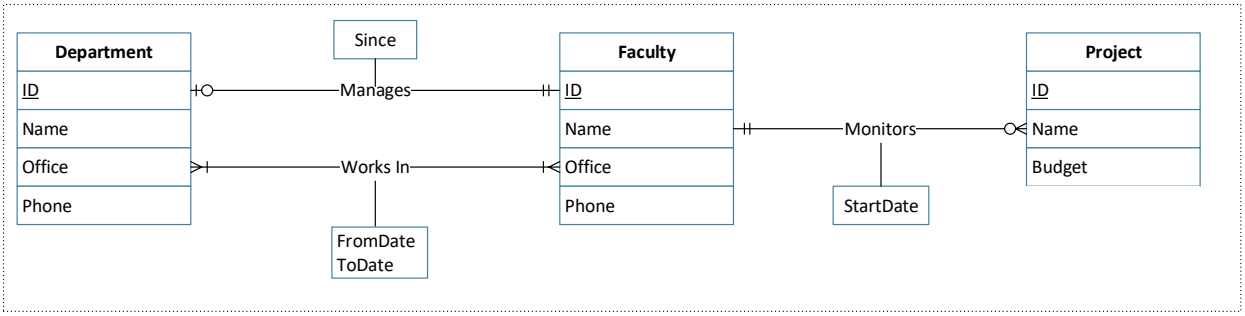
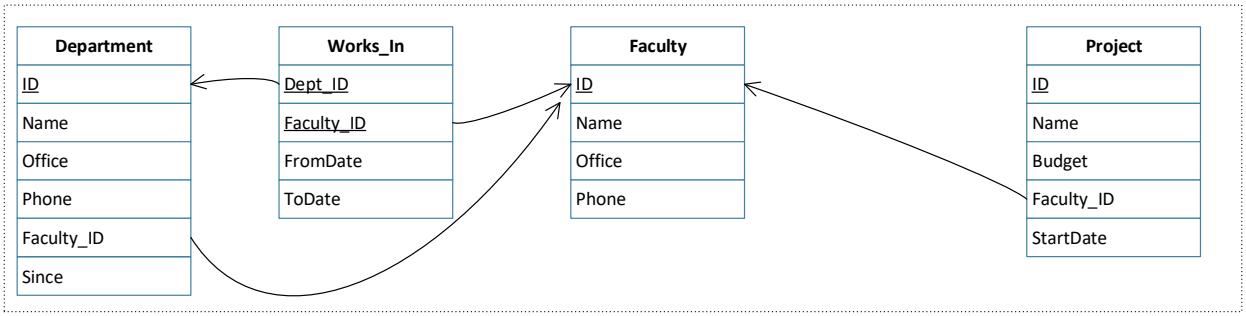


Figure 3: A Relational Schema based on Either Figure 1 or Figure 2



Your two tasks for this first assignment are as follows:

1. Draw an Entity Relationship diagram, using either the Key Constraint notation (see Figure 1) or the Crow's Foot notation (see Figure 2), based on the following narrative about assigning Hierarchical Condition Category (HCC) codes to patients to compute each patient's risk adjustment factor (RAF) score. Be sure to indicate the various attributes of each entity and relationship set; also specify the key

and participation constraints for each relationship set. The HCC is a coding system developed by the Centers for Medicare & Medicaid Services (CMS) to pay Medicare Advantage insurance companies. Along with demographic factors (such as age and gender), insurance companies assign HCC codes to patients to compute each patient's risk adjustment factor (RAF) score. Using algorithms, insurances can use a patient's RAF score to predict costs. The following table shows the RAF score and expected annual expenditure for a 76-year-old male that was assigned three HCC codes, corresponding to his three medical conditions (source: https://www.aafp.org/fpm/2016/0900/p24.html).

Risk Adjustment Factor (RAF)	**RAF Score**	**Expected Annual Expenditure**
Male 75 to 79 years old	1.062	$9,611
HCC 86, Acute myocardial infarction	0.282	$2,552
HCC 111, Chronic obstructive pulmonary disease	0.355	$3,213
HCC 137, Renal failure stage IV	0.230	$2,082
Totals	1.929	$17,457

The following is a *hypothetical* short list of HCC codes: 8, 9, 10, 11, 12, 17, 18, 19, 50, and 51. There are business rules (constraints) that relate HCC codes to other HCC codes. Several examples of business rules for HCC codes are as follows:

- HCC code 8 dominates codes 9, 10, 11, and 12. HCC code 9 dominates codes 10, 11, and 12. HCC Code 10 dominates codes 11 and 12. HCC code 11 dominates code 12
- HCC code 17 dominates codes 18 and 19. HCC code 18 dominates code 19.
- HCC code 50 dominates code 51.

The above business rules can be simplified as follows:
(8,9),(8,10),(8,11),(8,12),(9,10),(9,11),(9,12),(10,11),(10,12),(11,12),(17,18),(17,19),(18,19),(50,51).

Your task is as follows: draw an ER diagram that illustrates the relationships among PATIENT (id, patient name, address, phone, and date of birth), HCC_Code (code number, description), and the business rules that relate HCC codes to other HCC codes. Note that patients are assigned zero or more HCC codes.

2. Transform your Entity Relationship diagram from Question 1 above into a Relational schema (see Figure 3 for an example of a Relational schema). Underline each primary key. To represent a referential integrity constraint, show an arrow from each foreign key to its corresponding primary key. You do not need to show the domain constraint (data type) of each column (attribute). You do not need to create a physical schema.

Note:

1. To draw your ER diagram, you can use a computer-based graphic tool such as VISIO, Lucid Chart (lucidchart.com), Creately (creately.com), or Gliffy (gliffy.com).
2. Submit a printout of your first assignment in class on the due date. For each team member, don't forget to type your name and your UIC email address on each page of your submitted assignment.