# **Homework 3**

**Due date: October 28, 20223**

**Total 100 points**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Pirate\_ID*** | ***Name*** | ***Dept*** | ***Building*** | ***Class*** |
| 11 | Josh | COMP | E3 | Algo 1100 |
| 12 | Kirti | DASC | E4 | DA 2400 |
| 13 | Jack | BIO | B2 | Bio 1100 |
| 14 | Robert | COMP | E3 |  |
| 15 | Jackline | DASC | E4 |  |
| 16 | Matt | CHEM | CH4 |  |
| 17 | Justin | EDU | ED2 |  |

Table 1.

**Question 1:** From table 1 write 3 valid functional dependencies and explain it.

Pirate\_ID 🡪 Name

Building 🡪 Dept

Name 🡪 Dept

For each of these examples, the determinant (left) attribute determines the value of the dependent (right) attribute. That is given the determinant we know what the dependent feature will be.

**Question 2:** From table 1 write 3 invalid functional dependencies and explain it.

Building 🡪 Name

Dept 🡪 Name

Dept 🡪 Pirate\_ID

Each of these examples is the opposite of the ones from question 1. That is given the determinant we can not determine what the dependent feature will be.

**Question 3:** Suppose we have a relation on attributes ABCDE with these functional dependencies:

AC🡪E

CE🡪B

C-🡪D

DC🡪A

Check these two FD: **C🡪 E** and **ACD🡪B** follow from a set of FDs. Explain.

**C 🡪 E**

{C+} = {C, D, A, E, B}

Given C we can determine D, now knowing CD we can determine A, now knowing CDA we can determine E.

C 🡪 D, CD 🡪 A, CDA 🡪 E

**ACD 🡪 B**

{ACD+} = {A, C, D, E, B}

Given ACD we can determine E, now knowing ACDE we can determine B.

ACD 🡪 E, ACDE 🡪 B

**Question 4:** What are functional dependencies? Give two examples?

A functional dependency is a relationship between two features X and Y in a dataset where the determinant (X) determines the dependent (Y). It is denoted as X 🡪 Y.

Common functional dependencies would include ID 🡪 Name, residency, etc where the ID of a person can be used to identify them such as a social security number or driver’s license number. Another easy example would be ISBN 🡪 Title, Author, etc where the ISBN of a book can be used to identify it.

**Question 5:** What are conditional functional dependencies? Give two examples?

Conditional functional dependencies are the same as normal FD’s but only when a certain condition is met. Consider a dataset that contains the features: country, zip, street, etc.

|  |  |  |  |
| --- | --- | --- | --- |
| Country | Zip | Street | Etc. |
| USA | 27858 | 5th Street | -- |
| AUS | 34501 | Kangaroo Dr. | -- |
| USA | 27858 | 5th Street | -- |
| AUS | 34501 | Dingo Ave. | -- |
| USA | 26554 | Elm Blvd. | -- |

We can see that when Country = USA that Zip 🡪 Street is a valid functional dependency. But when Country = AUS then Zip 🡪 Street is no longer a valid dependency. So, our condition is Country = USA and our dependency is Country, Zip 🡪 Street, this can be denoted as ([Country, Zip] 🡪 Street (USA, \_ || \_)) where [Country, Zip] 🡪 Street describes the dependency and (USA, \_ || \_) describes the condition.