Anthony Basil

Exam 2: Problem Solving (35 points)

Instructions:

1. This is an **individual** exam.
2. This is the second part of the two part exam. First part is the multiple choice portion available separately.
3. Provide your responses on this file, save it, and upload the file to the appropriate assignment response in blackboard.
4. You may upload **only one** attempt.
5. Do not handwrite any responses.
6. If you have any additional information you would like me to know about this assignment, you may provide that to me at the end of this document as a note.

1. List and very briefly (one line) describe the 3 types of anomalies that may occur in tables **(2 X 3 = 6 points)**
   Update – inconsistency in data from data redundancy and a partial update
   Deletion – deletion of data resulting in unintended loss
   Insertion – the absence of data causes the inability to add data to database

2. List 3 prerequisites for a relation to be in 1NF **(1 X 3 = 3 points)**
   Each column must contain only one value, each row must contain the same columns, and a separate table for each entity and relationship.

3. Provide the definition of 2nd Normal Form (2NF) **(3 points)**
   A relationship that is in 1NF with every non-primary key being fully dependent on the primary key.

4. Provide the definition of 3rd Normal Form (3NF) **(3 points)**
   A relationship that is in 2NF and the non-primary keys have no transitive dependency on the primary key.

5. Refer to the ENROLLMENT relation below in answering the questions. Use only the data provided in the table to answer the questions.

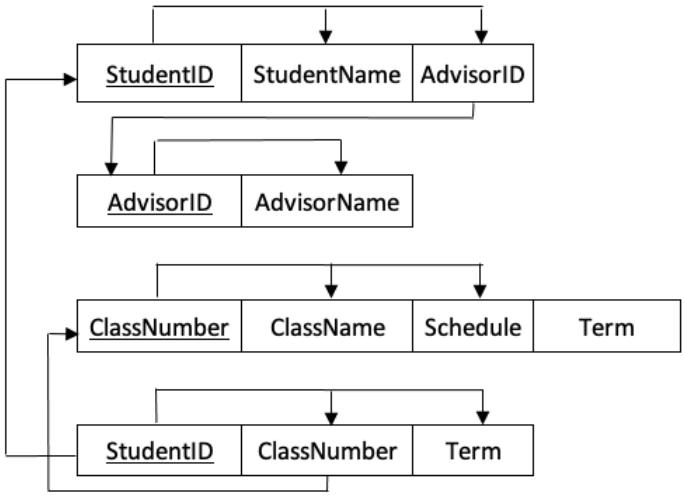
ENROLLMENT

Student Id	Student Name	Advisor Id	Advisor Name	Term	Class Number	Class Name	Schedule
101	Bill Milatur	902	Sandeep Goyal	Spring	CIS 3777	Database	TR 11:00-12:20
102	Tom Morrow	909	Dave Thomas	Spring	CIS 3293	Analytics	TR 2:00-3:20
103	Sharon Cash	903	Jake Jones	Spring	CS 5213	ERP I	MW 3:30-4:50
103	Sharon Cash	903	Jake Jones	Spring	CIS 3393	Software Dev	TR 8:00-9:20
104	Stan Doff	902	Sandeep Goyal	Spring	CS 3777	Database	TR 11:00-12:20
104	Stan Doff	902	Sandeep Goyal	Spring	CIS 5213	ERP I	MW 3:30-4:50
105	Crystal Ball	903	Jake Jones	Spring	CS 5223	ERP II	MW 2:00-3:20
105	Crystal Ball	903	Jake Jones	Fall	CS 5233	ERP III	TR 12:00-1:20

The following functional dependencies were inferred from the data in this table shown above:
Full: Student Id, Term, Class Number
Partial Functional: Student Id → Student Name, Advisor Id, Advisor Name
Partial Functional: Class Number → Class Name, Schedule (could be part of full)
Transitive: Advisor Id → Advisor Name

a. What normal form is the ENROLLMENT relation currently in? Why? **(4 points)**
The enrollment relation is currently in 1NF because some columns depend on the primary key (Student Name is dependent on Student ID) and there is also transitive dependency (Advisor Name is dependent on Advisor ID).

b. If ENROLLMENT relation is not in 3NF, normalize this table so it meets 3NF. You may either draw a set of normalized relations (boxes and lines) or a "data model" (ERD). You must include primary and foreign keys and how they are linked to each other. Also highlight the assumptions, if any, that you are making. **(16 points)**



Assumptions include: Students and advisors have a name, student will be enrolled in at least one class, and the class will occur during the term.