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COSC 386: Database Design and Implementation

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Assignment 1

1.

(I) What is the identifier of the WORK_ASSIGNMENT table?

A composition of PROJ_NUM and EMP_NUM. Both of these attributes are required for identification, as the identifier must uniquely identify each instance in the table. In the table, every attribute contains at least one duplicate dataset such that no individual attribute can uniquely identify an instance (row). For instance, the EMP_NUM 101 appears twice, but adding another attribute, such as PROJ_NUM, can uniquely identify each row as there will be a unique pair. For example, EMP_NUM 101, PROJ_NUM 1, and EMP_NUM 101, PROJ_NUM 2. This uniqueness is consistent with all rows using this composition of identifiers. Therefore, a composition of PROJ_NUM and EMP_NUM is the identifier of the WORK_ASSIGNMENT table.

(II) Describe (not define) the insertion anomaly.

An insertion anomaly is a type of data anomaly commonly caused by redundant information in a database. In particular, it is an issue inserting new data in a database due to missing information. For example, let's say that a new employee is hired for the company that is represented by the WORK_ASSIGNMENT table. Upon hire, this employee would be assigned an EMP_NUM, and EMP_NAME and EMP_PHONE would be documented. Let us make an assumption that an employee must be assigned a

project, such that PROJ_NUM and PROJ_NAME must not be left as null. Thus, given the structure of the table, the employee can not yet be added to the database as there is required information that is missing. This inability to insert new data into the database is an insertion anomaly.

(III) Describe (not define) the update anomaly.

An update anomaly is another type of data anomaly. In particular, it is a redundancy issue such that repeated information is updated by force. For example, let's say that the employee John D. Newson reports a phone number change to the company, so a change to the EMP_PHONE attribute is necessary. Then, when the database is updated, John's phone number will be updated in row 1 and row 4. This is an update anomaly, as in this case, instead of the information being updated one time, it must be updated twice. In general, this update anomaly could be much more drastic and be very inefficient.

However, this is not the only issue that arises with data anomalies. Let's say that the JOB_CODE attribute also requires an update for John D. Newson, but it is only updated for row 1, resulting in different information in row 1 and row 4 for John. The inconsistency in data that is created is also considered an update anomaly.

2. Break down the table in Question 1 into the following 4 new tables:

PROJECT: 2 columns + 3 rows, EMPLOYEE: 4 columns + 6 rows, JOB: 2 columns + 3 rows, ASSIGNMENT: 3 columns + 9 rows

PROJECT

PROJ_NUM (PK)	PROJ_NAME
1	Hurricane
2	Coast

3	Satellite
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EMPLOYEE

EMP_NUM (PK)	EMP_NAME	EMP_PHONE	JOB_CODE (FK)
101	John D. Newson	653-234-3245	EE
105	David F. Schwann	653-234-1123	CT
108	June H. Sattlemeir	905-554-7812	EE
110	Anne R. Ramoras	615-233-5568	CT
112	Allecia R. Smith	615-678-6879	BE
123	Mary D. Chen	615-233-5432	EE

JOB

JOB_CODE (PK)	JOB_CHG_HOUR
BE	85
CT	85
EE	62

ASSIGNMENT

PROJ_NUM (PK, FK1)	EMP_NUM (PK, FK2)	PROJ_HOURS
1	101	13.3
1	105	16.2
1	110	14.3
2	101	19.8
2	108	17.5

3	110	11.6
3	105	23.4
3	123	22.1
3	112	20.7

3. Conceptual Data Modeling

Using the Crow's Foot methodology, create an ERD that can be implemented for a medical clinic, using at least the following business rules: a. A patient can make many appointments with one or more doctors in the clinic, and a doctor can accept appointments with many patients. However, each appointment is made with only one doctor and one patient. b. Emergency cases do not require an appointment. However, for appointment management purposes, an emergency is entered in the appointment book as "unscheduled." c. If kept, an appointment yields a visit with the doctor specified in the appointment. The visit yields a diagnosis and, when appropriate, treatment. d. With each visit, the patient's records are updated to provide a medical history e. Each patient visit creates a bill. Each patient visit is billed by one doctor, and each doctor can bill many patients. f. Each bill must be paid. However, a bill may be paid in many installments, and a payment may cover more than one bill. g. A patient may pay the bill directly, or the bill may be the basis for a claim submitted to an insurance company. h. If the bill is paid by an insurance company, the deductible is submitted to the patient for payment.

