BACHELOR IN INFORMATICS ENGINEERING
Academic course: 2024/2025 – 2nd Year, 2nd term
Subject: *File Structures and Databases*
Statement of 1st Assignment: Relational DB Design and Implementation

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1. – PROBLEM DESCRIPTION

The Foundation for the Diffusion of Culture *Foundicu Org*. needs to update its databases to register and manage its bibliographic collections and activities, specifically those related to the dissemination of its collections through their mobile libraries for lending monographs (bibliobuses or "bibuses"). To do so, they provide us with the following specifications:

The Foundation has a fleet of mobile libraries or "bibliobuses" (hereinafter "bibuses") that cover predefined routes through a series of municipalities (one route per bibus daily at most). If these municipalities have a permanent library facility ("municipal library"), the *bibus* only stops briefly to deposit books that have been previously reserved, and to collect (from that library) those others that should be returned. Municipal Libraries have a tax code (CIF), name of the institution, date of foundation, municipality to which they belong, address where it is located, email and telephone number. Libraries have their own systems to manage their users and lending and returning of books in a transparent manner for our Foundation (for us, the only user there is the library, and it is responsible for all the copies it has received). In municipalities where there is no library, the bus stops briefly (from 15 to 30 minutes) so that the inhabitants of that municipality (or neighboring municipalities) can come and borrow some volumes.

Each municipality may have several upcoming scheduled services (bibuses are assigned routes on future dates). Municipalities have a name (unique within their province), and a population (number of inhabitants), and may have a municipal library. On a given date, a bibus may be assigned to a route, may be under technical inspection, or may be available (for beig¡ng assigned). Something similar happens with our "bibuseros" (the drivers in charge of the mobile units), who on each date may be assigned to a specific vehicle, have a day off, or not be on the route. When they are not on the route, they will have to go to one of our sites to perform other types of tasks (unless they are assigned to a route before that day). Regarding them, we know their name and surname(s), passport and phone numbers, email, contract start date, and contract end date of these drivers (not always, as there are drivers with permanent contracts). The books in the foundation's collection are identified by their title and author (main or first author), but they have many other characteristics: country of publication, original language, date of publication, alternative titles of the work, subject, content note, and awards. In addition, there may be more authors, and in that case an "author's mention" (each one's contribution) can be registered. Each book may have been published once, or many times. Besides, an edition of the book has an ISBN, main language, other languages, edition, publisher, length, series, legal deposit, place of publication, dimensions and other physical characteristics. In addition, it may have ancillary material and notes. Finally, it has an identifier from the National Library and URL.

There may be several copies of the same book (even of the same edition), which are differentiated by their signature (a code assigned to them when they are registered), their 'condition' (with a label between {new, good, worn, very used, deteriorated} and some comments incorporated by the bookkeeper, up to 500 characters). The book that is not valid

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for loans is deregistered (and physically destroyed, but its record remains in the database, indicating that it was deregistered and when). Naturally, a deregistered book cannot be loaned.

Books are borrowed for a period of two weeks, and no user can have more than 2 copies at a time, except municipal libraries that can have 2 copies for every ten inhabitants registered in the municipality. Users need to have a user card, with their full name, passport, date of birth, municipality, address, email (if they have one), and telephone number. In addition to loans, reservations (future loans) are also managed, associated with a (future, but already registered) visit of the bus to the municipality. Users can make comments about the books they have read (necessarily on a date after the loan date). Libraries do not have this possibility. The comments, apart from body or text, may have the approval of other users (we want to record only the likes, or number of positive votes, and the number of negative votes). Naturally, only available books (which are not lent/reserved in that period) can be borrowed and/or reserved. The books are returned after being borrowed on the next visit of the bibus to the municipality (after two weeks). There are sanctions for not returning a copy timely: as many weeks of penalty as weeks of delay in the return. The sanction is calculated and recorded at the time of return, and disqualifies the user from receiving loans and/or making reservations. If there were any pending reservations for that user, they would be automatically deleted. Libraries cannot be penalized, but they have a maximum quota of books (2 for every 10 inhabitants) and, if they reach that limit, they will not receive more copies until they have returned the ones they had.

2. – STARTING POINT

The current database is extremely poor, not covering all semantics required, and counting only on three disjointed tables (with hardly any restrictions): a table registering the bibliographic collection (acervus); a sample of the book loans (*loans*); and a last one with the mobile libraries routes and past services (*busstops*). The description of these tables is as follows:

```
SQL> desc fsdb.acervus

Name                        Type
------------------------    ---------------
SIGNATURE                   CHAR(20)
TITLE                       CHAR(200)
MAIN_AUTHOR                 CHAR(100)
ISBN                        CHAR(20)
PUB_COUNTRY                 CHAR(50)
MAIN_LANGUAGE               CHAR(50)
OTHER_LANGUAGES             CHAR(50)
ORIGINAL_LANGUAGE           CHAR(50)
PUB_DATE                    CHAR(12)
ALT_TITLE                   CHAR(200)
```

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```
TOPIC                     CHAR(200)
CONTENT_NOTES             VARCHAR2(2500)
AWARDS                    CHAR(200)
OTHER_AUTHORS             CHAR(200)
MENTION_AUTHORS           CHAR(200)
EDITION                   CHAR(50)
PUBLISHER                 CHAR(100)
EXTENSION                 CHAR(50)
SERIES                    CHAR(50)
COPYRIGHT                 CHAR(20)
PUB_PLACE                 CHAR(50)
DIMENSIONS                CHAR(50)
PHYSICAL_FEATURES         CHAR(200)
ATTACHED_MATERIALS        CHAR(200)
NOTES                     CHAR(500)
NATIONAL_LIB_ID           CHAR(20)
URL                       CHAR(200)


SQL> desc fsdb.loans

Name                      Type
----------------------    ---------------
SIGNATURE                 CHAR(20)
DATE_TIME                 CHAR(22)
RETURN                    CHAR(22)
USER_ID                   CHAR(10)
PASSPORT                  CHAR(20)
EMAIL                     CHAR(100)
NAME                      CHAR(80)
SURNAME1                  CHAR(80)
SURNAME2                  CHAR(80)
BIRTHDATE                 CHAR(10)
PHONE                     CHAR(9)
ADDRESS                   CHAR(150)
TOWN                      CHAR(50)
POST_DATE                 CHAR(22)
POST                      CHAR(2000)
LIKES                     CHAR(7)
DISLIKES                  CHAR(7)
```

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```
SQL> desc fsdb.busstops

Name                        Type
----------------------      ---------------
ROUTE_ID                    CHAR(5)
STOPDATE                    CHAR(10)
STOPTIME                    CHAR(8)
TOWN                        CHAR(50)
ADDRESS                     CHAR(100)
POPULATION                  CHAR(8)
HAS_LIBRARY                 CHAR(1)
PROVINCE                    CHAR(22)
PLATE                       CHAR(8)
LAST_ITV                    CHAR(22)
NEXT_ITV                    CHAR(22)
LIB_PASSPORT                CHAR(20)
LIB_EMAIL                   CHAR(100)
LIB_FULLNAME                CHAR(80)
LIB_BIRTHDATE               CHAR(10)
LIB_PHONE                   CHAR(9)
LIB_ADDRESS                 CHAR(100)
CONT_START                  CHAR(10)
CONT_END                    CHAR(10)
```

3. – SUPPORTING MATERIALS

Apart from classes and tutoring sessions, students can count on the following resources:

- Documents: assignment statement (this doc); class slides; template for writing the assignment report (.docx format)

- Audiovisual resources: video classes to acquire specific knowledge about the use of the tools that will be used in the laboratories (console management and pl/sql syntax) in the "inverted class" style.

- Sw Resources: user account on RDBMS Oracle (accessible from all computer rooms in the University, and from Aula Virtual), with enough privileges for all required operations and reading privileges on the obsolete DB's tables.

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4. – TO DO

a) Do an adequate Relational Design meeting the requirements (as possible). Represent it by means of a relational graph (use notation provided in class) and accompany with relevant comments about the non-observed explicit semantics (each assumption not reflected will have an identifier or a number to properly reference it in other sections), and the implicit semantic assumptions that have been included in the design.

b) Implement that design in PL/SQL (on DBMS Oracle®). The simple restrictions deemed appropriate will be included, indicating the explicit semantics they incorporate. Likewise, the new implicit/explicit-excluded semantic assumptions that appear in this phase will be documented.

c) Do a massive data upload (import) from the old DB to the newly created one. Notice there could appear errors during this process, due to the lack of some attributes and/or constraints (poor semantic coverage) in the former database. Coming from insufficiently defined tables, data may present inconsistencies, lack of integrity, and data errors in general. You must detect, analyze, typify, and describe them in the report. If possible, propose and implement some solution.

d) Document all the work carried out by means of the pertinent *Labwork Report*, for which composition a template is provided. Apart from including the relational graph and semantic comments, make sure that all design decisions are conveniently justified and thus reflected in the report.

e) Submit through Aula Global a compressed .zip file containing three files: two scripts (creation.sql, upload.sql) and the "*lab work report*" saved as .pdf (portable document format), and named *nia1_nia2_nia3_LW1.pdf* (where 'nia' is the students' identifier).