**Series of Practical Exercises No. 3: Information Codification**

**Exercise 1**

The proposed document presents an example of an invoice. We want to analyze this document to identify the information elements it contains and classify them if possible.

1. Extract all the information in this document, distinguishing between categories (attributes) and their occurrences.
2. Encode all attributes and specify the type of encoding used.
3. Provide an example for each feature.
4. Suppose we have automated invoicing; provide two examples for each type of control.

**Exercise 2**

**Part I (6 points)**

MonBus is a national company for student bus transport. It consists of 1,500 buses, each characterized by the year of circulation, the number of seats, and a unique chassis number. The chassis number is a complex set of alphanumeric signs assigned to each vehicle by the manufacturer, e.g., VF1BBR7CF31492667 by Renault or WVW1453FRRB354RBR4 by Volkswagen.

**Questions:**

1. In your opinion, why don't we replace the vehicle license plates with the chassis numbers, given they are unique? (2 points)
2. MonBus only contains buses. Modify the current license plates to adapt them to the company, and explain. (2 points)
3. We want more information about the affiliated university rather than just the province code. Propose a code. (2 points)

**Reminder:** Algerian vehicle registration system.



**Exercise 3: Codification a New University**

A new university is being constructed with 10 zones, each containing a maximum of 500 buildings.

1. Knowing each building has 40 rooms, calculate the number of rooms per zone.
2. Each building consists of two blocks, and each block has five floors. Propose an encoding to identify the zone, building, block, floor, and room number for each.
3. Suppose we want to introduce types of zones:
   * Lecture halls: max 50, 1 zone.
   * Administrative: max 50, 2 zones.
   * Lab rooms: Various types (Computer Science, Biology, Chemistry, Physics, Hydraulics, etc.), max 50/zone, 4 zones.
   * Libraries: 6 libraries/zone, 2 zones.
   * Recreational: 3 restaurants, 3 dorms, 2 sports halls (1 for girls, 1 for boys).

Propose a coding system for buildings in each type of zone, and a general coding system.

1. Provide codes for the following:
   * Administration No. 15.
   * All computer science lab rooms.
   * All buildings in zone 4.
   * Room No. 5 in zone 3.
   * Lecture hall No. 20.

**Exercise 4: (Supplementary, 2019 Exam Problem - 10 points)**

"El Ferha" nursery in your city characterizes each child by their code, name, first name, father’s name, mother’s name, sex, birth date, and place of birth.

Each caregiver manages several groups (max 10), with each group containing a maximum of 20 children. Children change groups and caregivers every year. Groups are created in four categories: Babies, Pre-kindergarten, Kindergarten, and Preschool. A category can have several groups (max 10).

To register their child, a parent downloads a form from the nursery’s website, gets it approved at the municipality, and submits it to the nursery’s management along with other documents: birth certificate, photo, and proof of residence. The parent must then pay either:

* In cash to the accountant (receives a payment slip), or
* By bank transfer, with a receipt characterized by a number, date, and amount.

The bank notifies the accountant of the payment. The accountant sends proof of payment (payment slip or transfer notification) to the management for printing and issuing the child's card to the parent.

**Part I: Coding**

1. Propose a coding system that changes every year, then improve it so it doesn’t change. (2 points)
2. Modify your code to indicate the city and municipality. (0.5 points)
3. How can it be made national? (0.5 points)

**Part II: Automation**

1. Draw the information flow diagram. (2 points)
2. Provide two programmed and two programmable actions. (1 point)
3. Give an example of direct control and indirect control. (2 points)

**Part III: Modeling**

1. Identify all entities with their attributes. (2 points)

**Reminder:**  
A code is an abbreviated representation of information.  
Two main applications of coding:

1. Assigning a unique name to a variable in an algorithm or program.  
   Example: Student number (e.g., NumEtud).
2. Defining rules for the value of a manipulated data element.

Examples of coding types:

1. **Sequential Coding:** Assigning consecutive numbers to objects.
   * Example: 0101, 0102, ...
2. **Segmented Coding:** Reserving code ranges for object categories.
   * Example: Pharmacy stock management:
     + 0001–0999: Over-the-counter drugs.
       - 0001–0099: Painkillers.
       - 0100–0599: Anti-inflammatories.
     + 1100–1500: Prescription-only drugs.
3. **Articulated Coding:** Codes are divided into segments, each with specific meaning.
   * Example: Vehicle registration.
4. **Hierarchical Coding:** A type of articulated coding using hierarchical levels.
   * Example: Book structure.
5. **Mnemonic Coding:** Representing an object name with characters that remind us of it.
   * Example: Student number (NumEtud).