**Lab 4 Tasks**

**Task 1: LUHN Algorithm**

**Objective**

The Luhn Algorithm is used to validate identification numbers like **credit card numbers**. It helps detect errors in input by verifying the check digit.

**Python Code**

def luhn\_algorithm(card\_number):

card\_number = card\_number.replace(" ", "") # remove spaces

total = 0

reverse\_digits = card\_number[::-1]

for i, digit in enumerate(reverse\_digits):

n = int(digit)

if i % 2 == 1: # double every second digit

n \*= 2

if n > 9:

n -= 9

total += n

return total % 10 == 0

# Example

card = "4539 1488 0343 6467"

if luhn\_algorithm(card):

print("Valid card number")

else:

print("Invalid card number")

**Explanation**

* The card number is reversed for easier processing.
* Every **second digit** (from the right) is **doubled**.
* If doubling gives a value greater than 9, **subtract 9** from it.
* Sum all digits; if the total is **divisible by 10**, the number is valid.

**Example Output:**

Valid card number

**Task 2: Remove Punctuations from a String**

**Objective**

To clean a string by removing all punctuation marks.

**Python Code**

def remove\_punctuations(text):

punctuations = '''!()-[]{};:'"\\,<>./?@#$%^&\*\_~'''

result = ""

for char in text:

if char not in punctuations:

result += char

return result

# Example

string = "Hello!!!, how are you doing today?"

print("After removing punctuations:", remove\_punctuations(string))

**Explanation**

* Defines a string containing all **punctuation marks**.
* Iterates through each character in the text.
* Only **non-punctuation characters** are added to the result.

**Example Output:**

After removing punctuations: Hello how are you doing today

**Task 3: Sort a Sentence in Alphabetical Order**

**Objective**

To sort all words in a sentence alphabetically.

**Python Code**

def sort\_sentence(sentence):

words = sentence.split()

words.sort()

sorted\_sentence = " ".join(words)

return sorted\_sentence

# Example

sentence = "Python makes programming fun and easy"

print("Alphabetically sorted sentence:", sort\_sentence(sentence))

**Explanation**

* Splits the sentence into individual words using .split().
* Sorts the list of words in **alphabetical order** using .sort().
* Joins them back into a single string using " ".join().

**Example Output:**

Alphabetically sorted sentence: Python and easy fun makes programming

**✅ Conclusion**

In this lab, we learned how to:

* Validate numbers using the **Luhn Algorithm**.
* Clean text data by **removing punctuation marks**.
* Organize text using **alphabetical sorting**.

These tasks help in understanding **data validation**, **text processing**, and **string manipulation** in Python.