School of Computer Science and Artificial Intelligence

Lab Assignment # 3.1

Program	**: B. Tech (CSE)**
Specialization	**: AIML**
Course Title	**: AI Assisted**
Coding Course Code	**: 23CS002PC304**
Semester	**: VI**
Academic Session	**: 2025-2026**
Name of Student	**: Nitesh kumar**
Enrollment No.	**: 2303A52098**
Batch No.	**: 33**
Date	**: 13/01/26**

Title

Experiment on Prompt Engineering Techniques for Python Program Generation Using AI-Assisted Tools

---

Lab Objectives

1. To understand and apply different **prompt engineering techniques** for generating Python programs using AI-assisted tools.
2. To analyze the **impact of context, constraints, and examples** on the accuracy and efficiency of AI-generated code.
3. To develop and refine **real-world Python applications** through iterative prompt improvement and testing.

Lab Outcomes

1. Students will be able to **design effective prompts** to generate correct and optimized Python code.
2. Students will be able to **compare and evaluate AI-generated solutions** produced using different prompting strategies.
3. Students will be able to **implement, test, and document real-world Python applications** using AI-assisted coding tools.

Tools Used

- AI-assisted coding tool (ChatGPT)
- Python 3.x
- Standard Python IDE / Interpreter

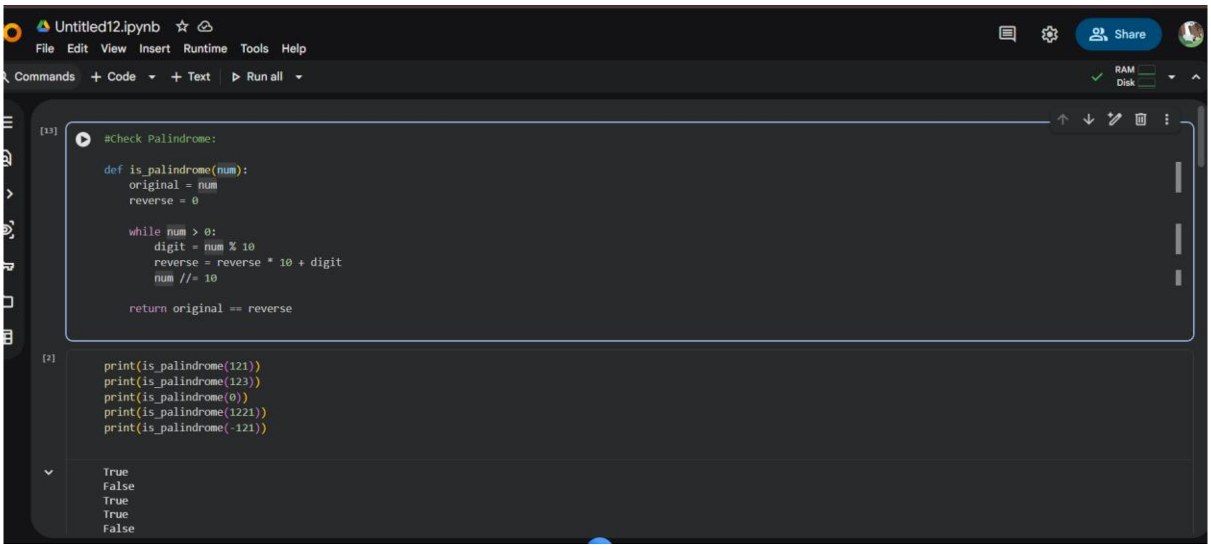
Experiment 1: Zero-Shot Prompting – Palindrome Number

Prompt Type: Zero-Shot

Objective: Check whether a number is a palindrome.

Observations
- AI generated correct logic for positive integers.
- Failed to explicitly handle negative numbers.
- Required manual refinement for edge cases.

CODE:


Untitled12.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text ▷ Run all
Share
RAM Disk

```
#Check Palindrome:

def is_palindrome(num):
    original = num
    reverse = 0

    while num > 0:
        digit = num % 10
        reverse = reverse * 10 + digit
        num //= 10

    return original == reverse
```

```
print(is_palindrome(121))
print(is_palindrome(123))
print(is_palindrome(0))
print(is_palindrome(1221))
print(is_palindrome(-121))
```

```
True
False
True
True
False
```

Experiment 2: One-Shot Prompting – Factorial Calculation

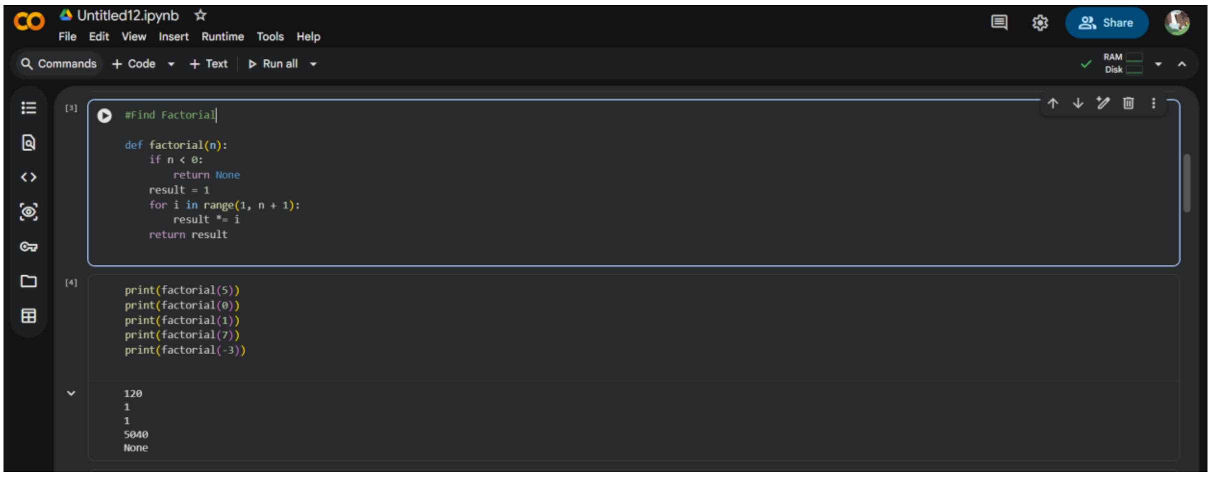
Prompt Type: One-Shot

Example Given: Input: 5 → Output: 120

Observations

- Code clarity improved compared to zero-shot.
- Handled 0! correctly.
- Included basic validation for negative numbers.

CODE:


Untitled12.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text ▷ Run all
Share
RAM Disk

```
#Find Factorial

def factorial(n):
    if n < 0:
        return None
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result
```

```
print(factorial(5))
print(factorial(0))
print(factorial(1))
print(factorial(7))
print(factorial(-3))
```

```
120
1
1
5040
None
```

Experiment 3: Few-Shot Prompting – Armstrong Number Check

Prompt Type: Few-Shot

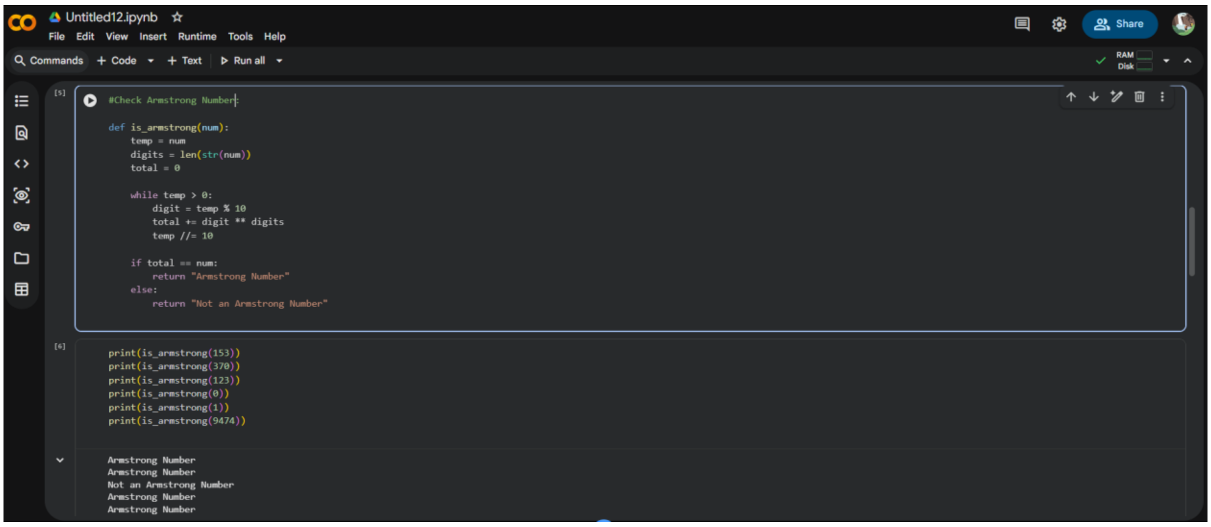
Examples Provided:

- 153 → Armstrong Number
- 370 → Armstrong Number
- 123 → Not an Armstrong Number

Observations

- Correct mathematical logic inferred.
- Output format matched examples exactly.
- Input validation required additional refinement.

CODE:



```python
#Check Armstrong Number:

def is_armstrong(num):
    temp = num
    digits = len(str(num))
    total = 0

    while temp > 0:
        digit = temp % 10
        total += digit ** digits
        temp //= 10

    if total == num:
        return "Armstrong Number"
    else:
        return "Not an Armstrong Number"
```

```python
print(is_armstrong(153))
print(is_armstrong(370))
print(is_armstrong(123))
print(is_armstrong(0))
print(is_armstrong(1))
print(is_armstrong(9474))
```

```
Armstrong Number
Armstrong Number
Not an Armstrong Number
Armstrong Number
Armstrong Number
```

Experiment 4: Context-Managed Prompting – Number Classification

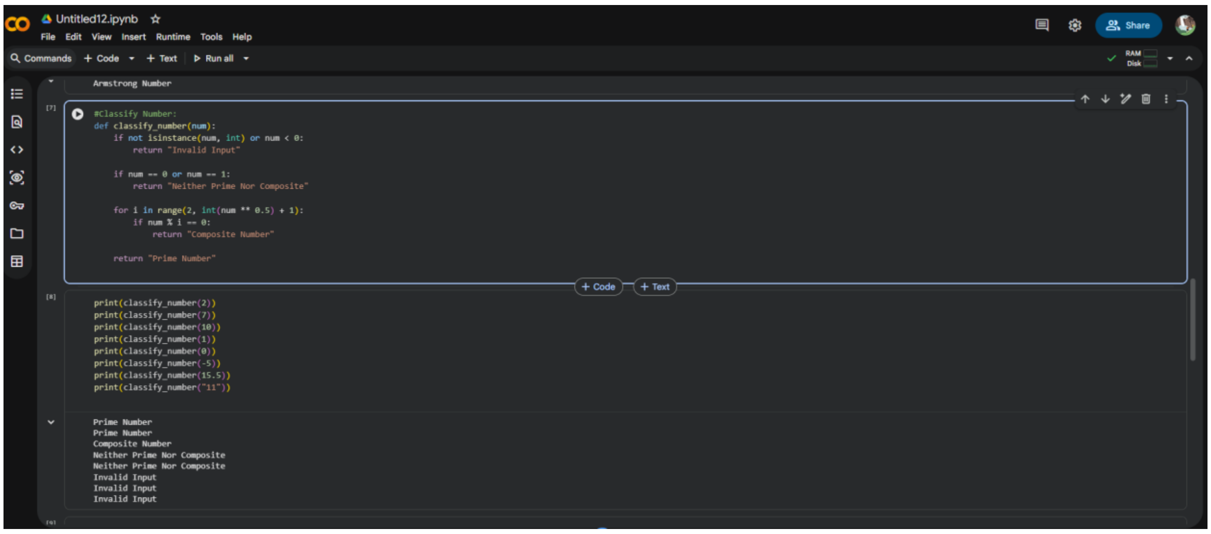
Prompt Type: Context-Managed

Task: Classify a number as **Prime**, **Composite**, or **Neither**.

Observations

- Efficient √n optimization applied.
- Proper handling of 0, 1, and invalid inputs.
- Most robust and production-ready solution.

CODE:



```
Armstrong Number
```

```python
#Classify Number:
def classify_number(num):
    if not isinstance(num, int) or num < 0:
        return "Invalid Input"

    if num == 0 or num == 1:
        return "Neither Prime Nor Composite"

    for i in range(2, int(num ** 0.5) + 1):
        if num % i == 0:
            return "Composite Number"

    return "Prime Number"
```

```python
print(classify_number(2))
print(classify_number(7))
print(classify_number(10))
print(classify_number(1))
print(classify_number(0))
print(classify_number(-5))
print(classify_number(15.5))
print(classify_number("11"))
```

```
Prime Number
Prime Number
Composite Number
Neither Prime Nor Composite
Neither Prime Nor Composite
Invalid Input
Invalid Input
Invalid Input
```

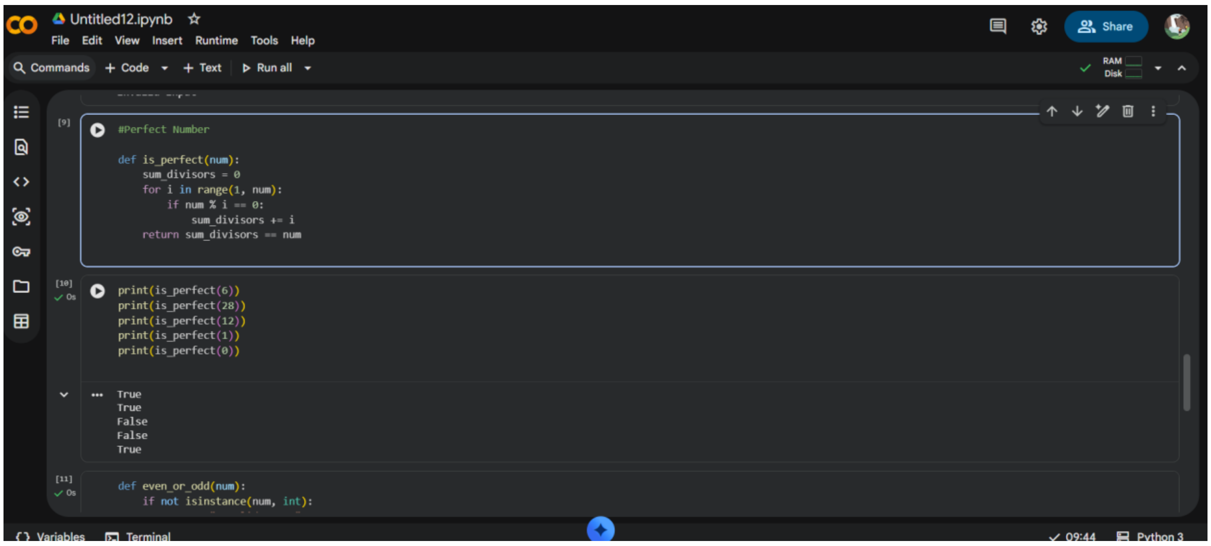
Experiment 5: Zero-Shot Prompting – Perfect Number Check

Prompt Type: Zero-Shot

Observations

- Basic logic generated correctly.
- Logical error for input 0.
- Inefficient O(n) loop required optimization.

CODE:



```python
#Perfect Number

def is_perfect(num):
    sum_divisors = 0
    for i in range(1, num):
        if num % i == 0:
            sum_divisors += i
    return sum_divisors == num
```

```python
print(is_perfect(6))
print(is_perfect(28))
print(is_perfect(12))
print(is_perfect(1))
print(is_perfect(0))
```

```
True
True
False
False
True
```

```python
def even_or_odd(num):
    if not isinstance(num, int):
```

Experiment 6: Few-Shot Prompting – Even or Odd with Validation

Prompt Type: Few-Shot

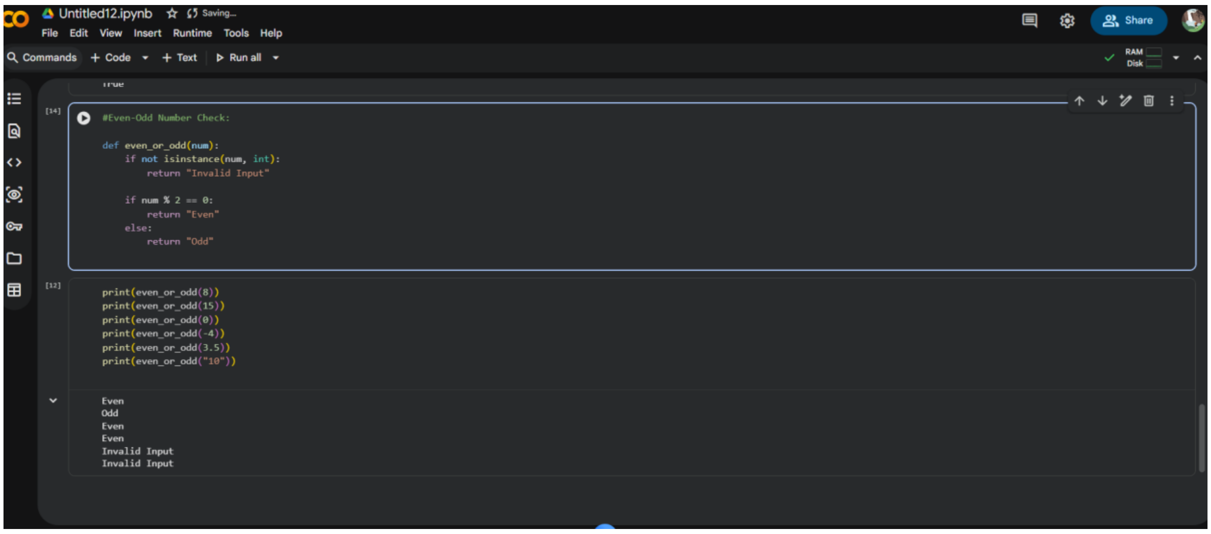
Examples Provided:

- 8 → Even
- 15 → Odd
- 0 → Even

Observations

- Proper input validation inferred.
- Clear and consistent output.
- Negative numbers handled correctly.

CODE:



```
True
```

[14]

```
#Even-Odd Number Check:

def even_or_odd(num):
    if not isinstance(num, int):
        return "Invalid Input"

    if num % 2 == 0:
        return "Even"
    else:
        return "Odd"
```

[12]

```
print(even_or_odd(8))
print(even_or_odd(15))
print(even_or_odd(0))
print(even_or_odd(-4))
print(even_or_odd(3.5))
print(even_or_odd("10"))
```

```
Even
Odd
Even
Even
Invalid Input
Invalid Input
```

Comparative Analysis

Prompting Technique	Accuracy	Validation	Efficiency	Clarity
Zero-Shot	Medium	Low	Low	Average
One-Shot	Good	Medium	Medium	Good
Few-Shot	High	High	Medium	Very Good
Context-Managed	Very High	Very High	High	Excellent

Result

- The quality of AI-generated Python code **improves significantly** with better prompt design.

- Few-shot and context-managed prompting produced **more accurate, optimized, and reliable programs**.
- Zero-shot prompting is suitable only for **simple tasks** and requires manual verification.

Conclusion:

This lab successfully demonstrated the effectiveness of various **prompt engineering techniques** in generating Python programs using AI-assisted tools. As the level of guidance in prompts increased—from zero-shot to context-managed—the **accuracy, efficiency, and robustness** of the generated code also improved. Proper prompt design plays a critical role in producing reliable AI-generated software solutions.

Future Scope:

1. Applying prompt engineering techniques to **larger real-world applications** such as web development and data analysis.
2. Exploring advanced prompting methods like **chain-of-thought and self-consistency prompting**.
3. Integrating AI-assisted coding tools into **software engineering workflows** for improved productivity.