ASSIGNMENT – 3.1

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Question 1:
Zero-Shot Prompting (Palindrome Number Program)

Write a zero-shot prompt (without providing any examples) to generate

a Python function that checks whether a given number is a palindrome.

Task:

• Record the AI-generated code.

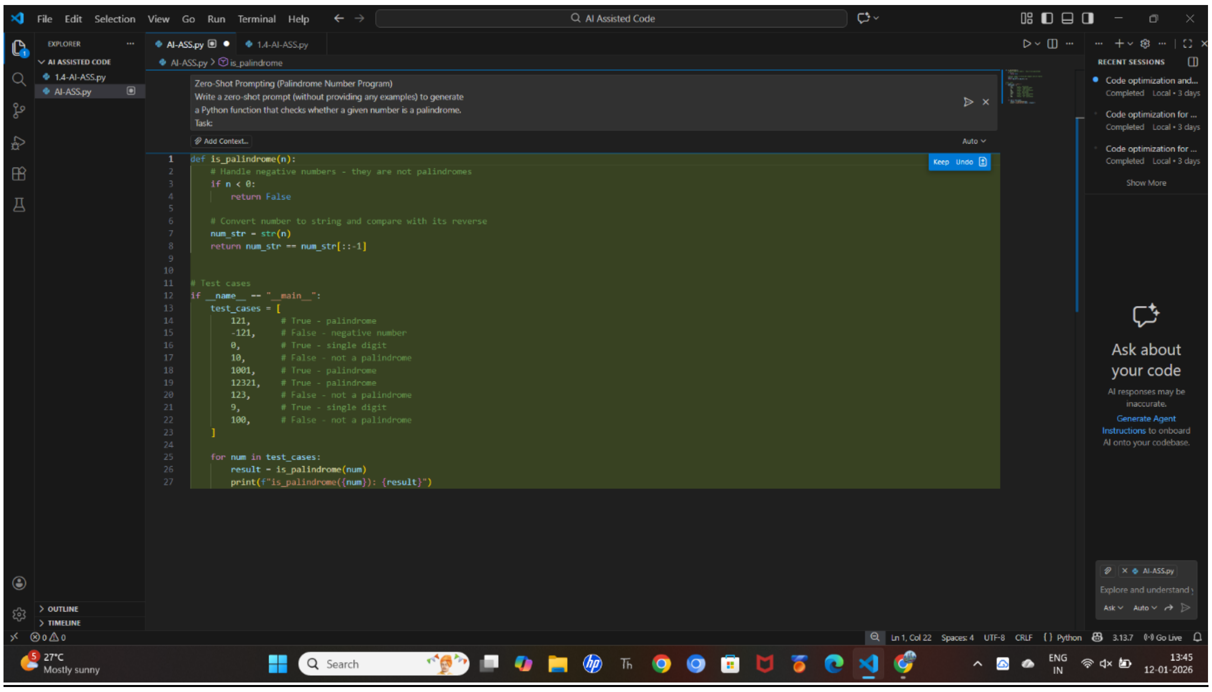
• Test the code with multiple inputs.

• Identify any logical errors or missing edge-case handling.

PROMPT:

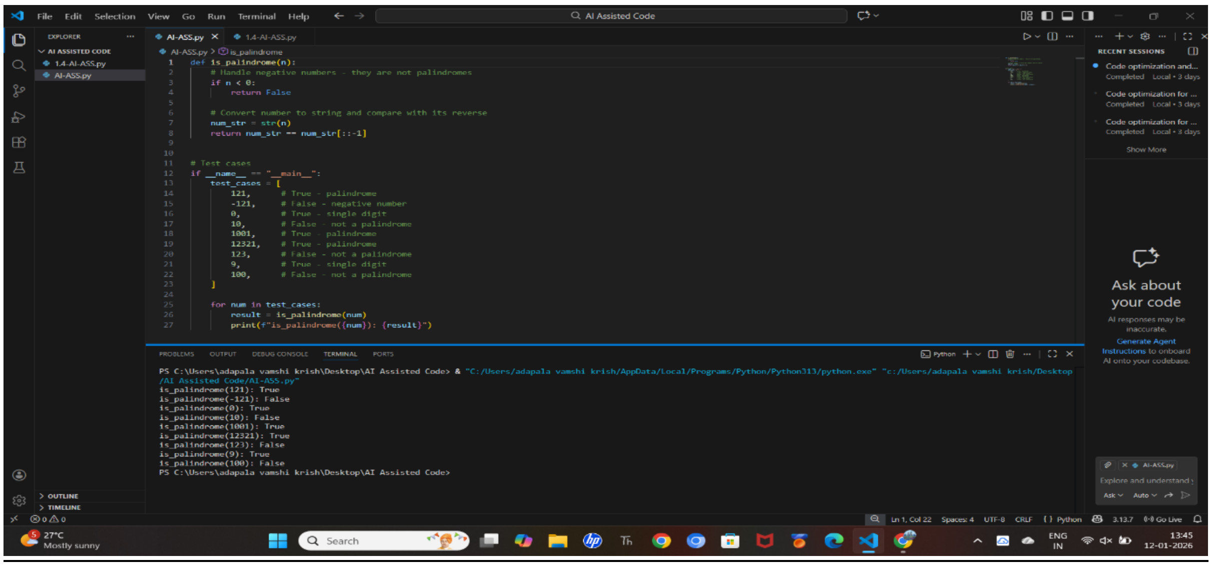
checking whether given number it is palindrome or not

CODE:



Zero-Shot Prompting (Palindrome Number Program)
Write a zero-shot prompt (without providing any examples) to generate
a Python function that checks whether a given number is a palindrome.
Task:

```python
def is_palindrome(n):
    # Handle negative numbers - they are not palindromes
    if n < 0:
        return False

    # Convert number to string and compare with its reverse
    num_str = str(n)
    return num_str == num_str[::-1]


# Test cases
if __name__ == "__main__":
    test_cases = [
        121,      # True - palindrome
        -121,     # False - negative number
        0,        # True - single digit
        10,       # False - not a palindrome
        1001,     # True - palindrome
        12321,    # True - palindrome
        123,      # False - not a palindrome
        9,        # True - single digit
        100,      # False - not a palindrome
    ]

    for num in test_cases:
        result = is_palindrome(num)
        print(f"is_palindrome({num}): {result}")
```



```python
def is_palindrome(n):
    # Handle negative numbers - they are not palindromes
    if n < 0:
        return False

    # Convert number to string and compare with its reverse
    num_str = str(n)
    return num_str == num_str[::-1]


# Test cases
if __name__ == "__main__":
    test_cases = [
        121,       # True - palindrome
        -121,      # False - negative number
        0,         # True - single digit
        10,        # False - not a palindrome
        1001,      # True - palindrome
        12321,     # True - palindrome
        123,       # False - not a palindrome
        9,         # True - single digit
        100,       # False - not a palindrome
    ]

    for num in test_cases:
        result = is_palindrome(num)
        print(f"is_palindrome({num}): {result}")
```

```
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop
/AI Assisted Code/AI-ASS.py"
is_palindrome(121): True
is_palindrome(-121): False
is_palindrome(0): True
is_palindrome(10): False
is_palindrome(1001): True
is_palindrome(12321): True
is_palindrome(123): False
is_palindrome(9): True
is_palindrome(100): False
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```

Question 2:
One-Shot Prompting (Factorial Calculation)

Write a one-shot prompt by providing one input-output example and ask the AI to generate a Python function to compute the factorial of a given number.

Example:

Input: 5 → Output: 120

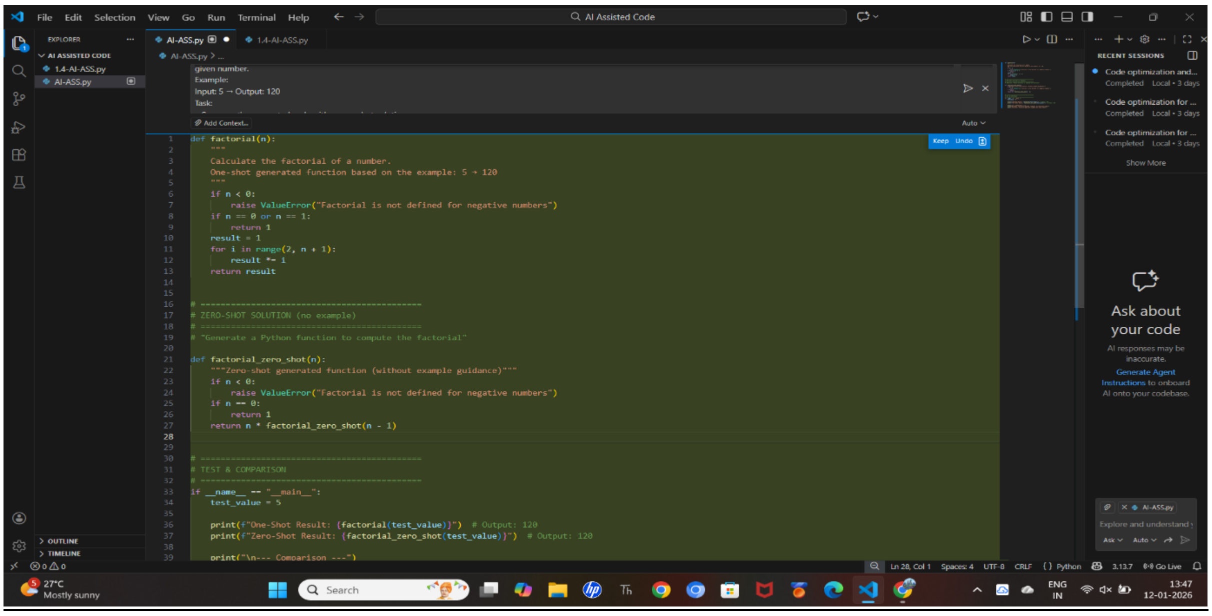
Task:

• Compare the generated code with a zero-shot solution.

• Examine improvements in clarity and correctness.

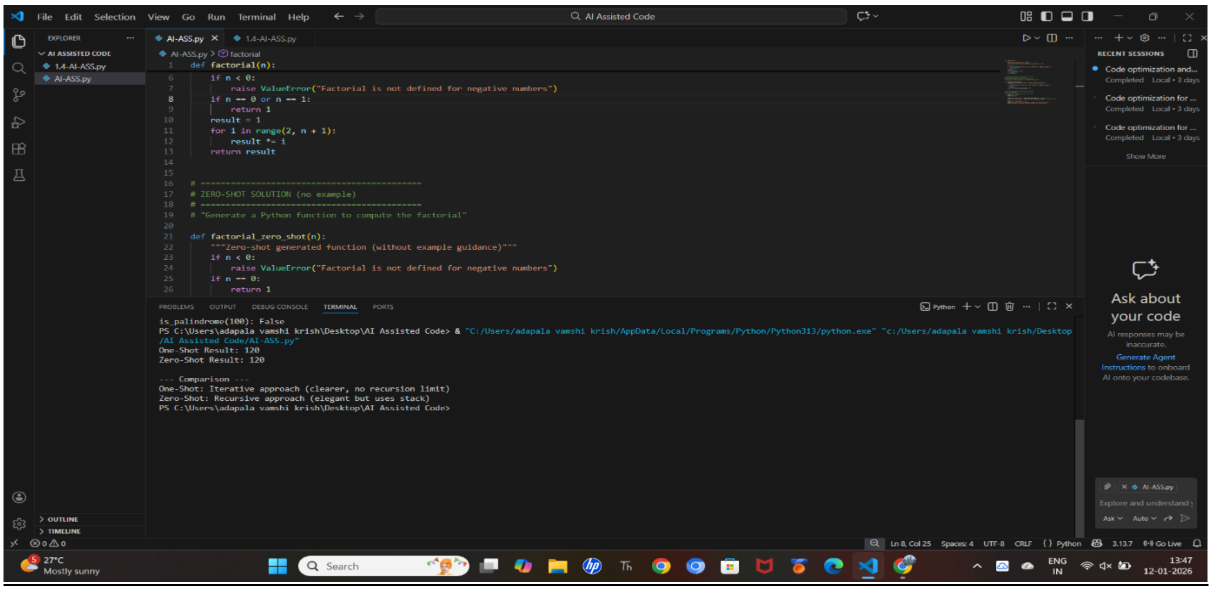
PROMPT: **Factorial Calculation giving some instructions input data**

CODE:



```
given number.
Example:
Input: 5 → Output: 120
Task:
```

```python
def factorial(n):
    """
    Calculate the factorial of a number.
    One-shot generated function based on the example: 5 → 120
    """
    if n < 0:
        raise ValueError("Factorial is not defined for negative numbers")
    if n == 0 or n == 1:
        return 1
    result = 1
    for i in range(2, n + 1):
        result *= i
    return result


# ============================================
# ZERO-SHOT SOLUTION (no example)
# ============================================
# "Generate a Python function to compute the factorial"

def factorial_zero_shot(n):
    """Zero-shot generated function (without example guidance)"""
    if n < 0:
        raise ValueError("Factorial is not defined for negative numbers")
    if n == 0:
        return 1
    return n * factorial_zero_shot(n - 1)


# ============================================
# TEST & COMPARISON
# ============================================
if __name__ == "__main__":
    test_value = 5

    print(f"One-Shot Result: {factorial(test_value)}")  # Output: 120
    print(f"Zero-Shot Result: {factorial_zero_shot(test_value)}")  # Output: 120

    print("\n--- Comparison ---")
```



```python
def factorial(n):
    if n < 0:
        raise ValueError("Factorial is not defined for negative numbers")
    if n == 0 or n == 1:
        return 1
    result = 1
    for i in range(2, n + 1):
        result *= i
    return result


# -------------------------------------------
# ZERO-SHOT SOLUTION (no example)
# -------------------------------------------
# "Generate a Python function to compute the factorial"

def factorial_zero_shot(n):
    """Zero-shot generated function (without example guidance)"""
    if n < 0:
        raise ValueError("Factorial is not defined for negative numbers")
    if n == 0:
        return 1
```

```
is_palindrome(100): False
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop
/AI Assisted Code/AI-ASS.py"
One-Shot Result: 120
Zero-Shot Result: 120

--- Comparison ---
One-Shot: Iterative approach (clearer, no recursion limit)
Zero-Shot: Recursive approach (elegant but uses stack)
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```

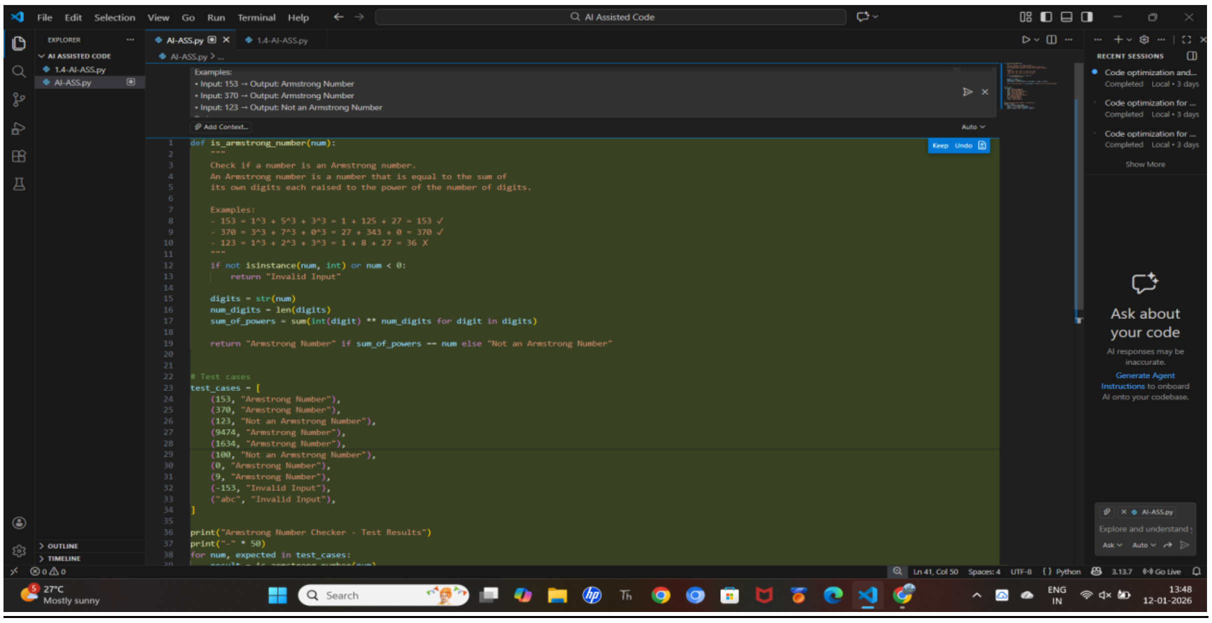
Question 3: Few-Shot Prompting (Armstrong Number Check)

Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python function to check whether a given number is an Armstrong number.
Examples:
• Input: 153 → Output: Armstrong Number
• Input: 370 → Output: Armstrong Number
• Input: 123 → Output: Not an Armstrong Number

Task:
• Analyze how multiple examples influence code structure and accuracy.
• Test the function with boundary values and invalid inputs.

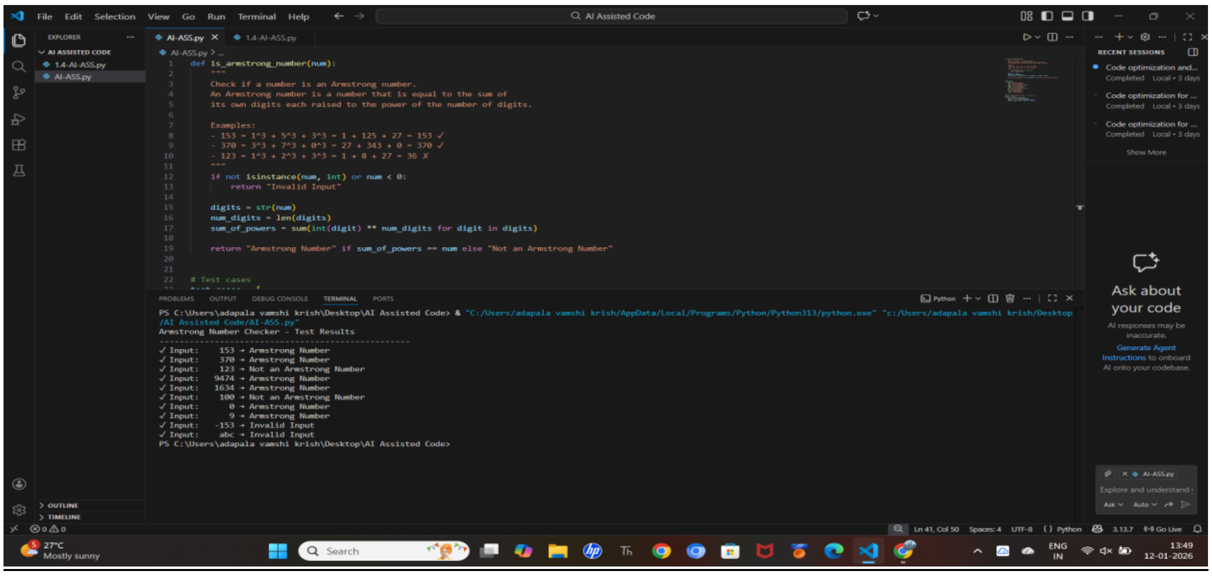
<u>PROMPT</u>:   Armstrong Number Check
• Input: 153 → Output: Armstrong Number
• Input: 370 → Output: Armstrong Number
• Input: 123 → Output: Not an Armstrong Number

<u>CODE:</u>



Examples:
• Input: 153 → Output: Armstrong Number
• Input: 370 → Output: Armstrong Number
• Input: 123 → Output: Not an Armstrong Number

```python
def is_armstrong_number(num):
    """
    Check if a number is an Armstrong number.
    An Armstrong number is a number that is equal to the sum of
    its own digits each raised to the power of the number of digits.

    Examples:
    - 153 = 1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153 ✓
    - 370 = 3^3 + 7^3 + 0^3 = 27 + 343 + 0 = 370 ✓
    - 123 = 1^3 + 2^3 + 3^3 = 1 + 8 + 27 = 36 X
    """
    if not isinstance(num, int) or num < 0:
        return "Invalid Input"

    digits = str(num)
    num_digits = len(digits)
    sum_of_powers = sum(int(digit) ** num_digits for digit in digits)

    return "Armstrong Number" if sum_of_powers == num else "Not an Armstrong Number"


# Test cases
test_cases = [
    (153, "Armstrong Number"),
    (370, "Armstrong Number"),
    (123, "Not an Armstrong Number"),
    (9474, "Armstrong Number"),
    (1634, "Armstrong Number"),
    (100, "Not an Armstrong Number"),
    (0, "Armstrong Number"),
    (9, "Armstrong Number"),
    (-153, "Invalid Input"),
    ("abc", "Invalid Input"),
]

print("Armstrong Number Checker - Test Results")
print("-" * 50)
for num, expected in test_cases:
```



```python
def is_armstrong_number(num):
    """
    Check if a number is an Armstrong number.
    An Armstrong number is a number that is equal to the sum of
    its own digits each raised to the power of the number of digits.

    Examples:
    - 153 = 1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153 ✓
    - 370 = 3^3 + 7^3 + 0^3 = 27 + 343 + 0 = 370 ✓
    - 123 = 1^3 + 2^3 + 3^3 = 1 + 8 + 27 = 36 ✗
    """
    if not isinstance(num, int) or num < 0:
        return "Invalid Input"

    digits = str(num)
    num_digits = len(digits)
    sum_of_powers = sum(int(digit) ** num_digits for digit in digits)

    return "Armstrong Number" if sum_of_powers == num else "Not an Armstrong Number"


# Test cases
```

```
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop/AI Assisted Code/AI-ASS.py"
Armstrong Number Checker - Test Results
--------------------------------------------------
✓ Input:    153 → Armstrong Number
✓ Input:    370 → Armstrong Number
✓ Input:    123 → Not an Armstrong Number
✓ Input:   9474 → Armstrong Number
✓ Input:   1634 → Armstrong Number
✓ Input:    100 → Not an Armstrong Number
✓ Input:      0 → Armstrong Number
✓ Input:      9 → Armstrong Number
✓ Input:   -153 → Invalid Input
✓ Input:    abc → Invalid Input
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```

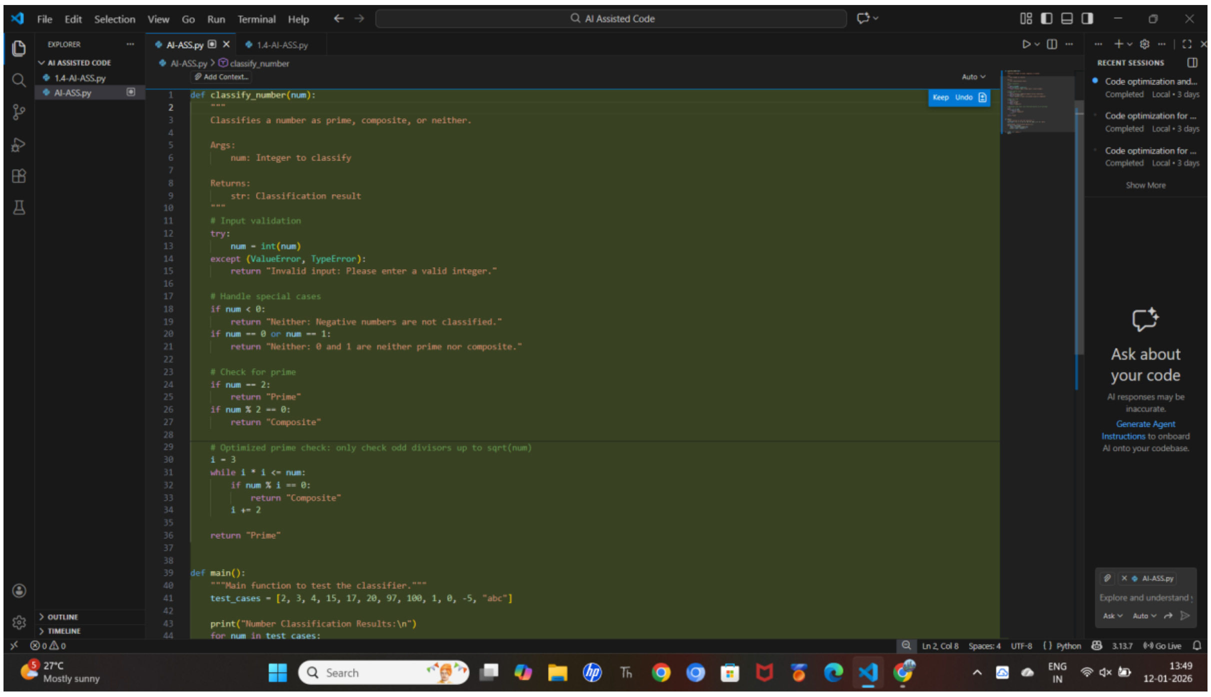
Question 4: Context-Managed Prompting (Optimized Number Classification)

Design a context-managed prompt with clear instructions and
constraints to generate an optimized Python program that classifies a number as prime, composite, or neither.

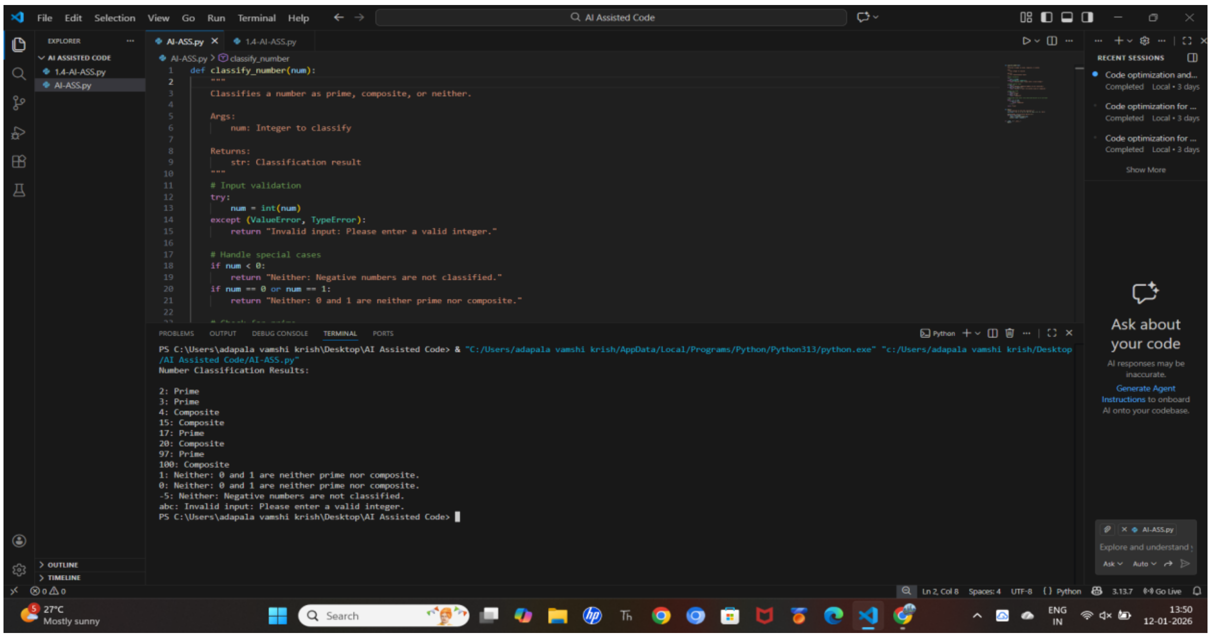
Task:

• Ensure proper input validation.
• Optimize the logic for efficiency.
• Compare the output with earlier prompting strategies.

PROMPT: Optimized Number Classification
CODE:



```python
def classify_number(num):
    """
    Classifies a number as prime, composite, or neither.

    Args:
        num: Integer to classify

    Returns:
        str: Classification result
    """
    # Input validation
    try:
        num = int(num)
    except (ValueError, TypeError):
        return "Invalid input: Please enter a valid integer."

    # Handle special cases
    if num < 0:
        return "Neither: Negative numbers are not classified."
    if num == 0 or num == 1:
        return "Neither: 0 and 1 are neither prime nor composite."

    # Check for prime
    if num == 2:
        return "Prime"
    if num % 2 == 0:
        return "Composite"

    # Optimized prime check: only check odd divisors up to sqrt(num)
    i = 3
    while i * i <= num:
        if num % i == 0:
            return "Composite"
        i += 2

    return "Prime"


def main():
    """Main function to test the classifier."""
    test_cases = [2, 3, 4, 15, 17, 20, 97, 100, 1, 0, -5, "abc"]

    print("Number Classification Results:\n")
    for num in test_cases:
```



```python
def classify_number(num):
    """
    Classifies a number as prime, composite, or neither.

    Args:
        num: Integer to classify

    Returns:
        str: Classification result
    """
    # Input validation
    try:
        num = int(num)
    except (ValueError, TypeError):
        return "Invalid input: Please enter a valid integer."

    # Handle special cases
    if num < 0:
        return "Neither: Negative numbers are not classified."
    if num == 0 or num == 1:
        return "Neither: 0 and 1 are neither prime nor composite."

```

```
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop
/AI Assisted Code/AI-ASS.py"
Number Classification Results:

2: Prime
3: Prime
4: Composite
15: Composite
17: Prime
20: Composite
97: Prime
100: Composite
1: Neither: 0 and 1 are neither prime nor composite.
0: Neither: 0 and 1 are neither prime nor composite.
-5: Neither: Negative numbers are not classified.
abc: Invalid input: Please enter a valid integer.
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```

Question 5: Zero-Shot Prompting (Perfect Number Check)

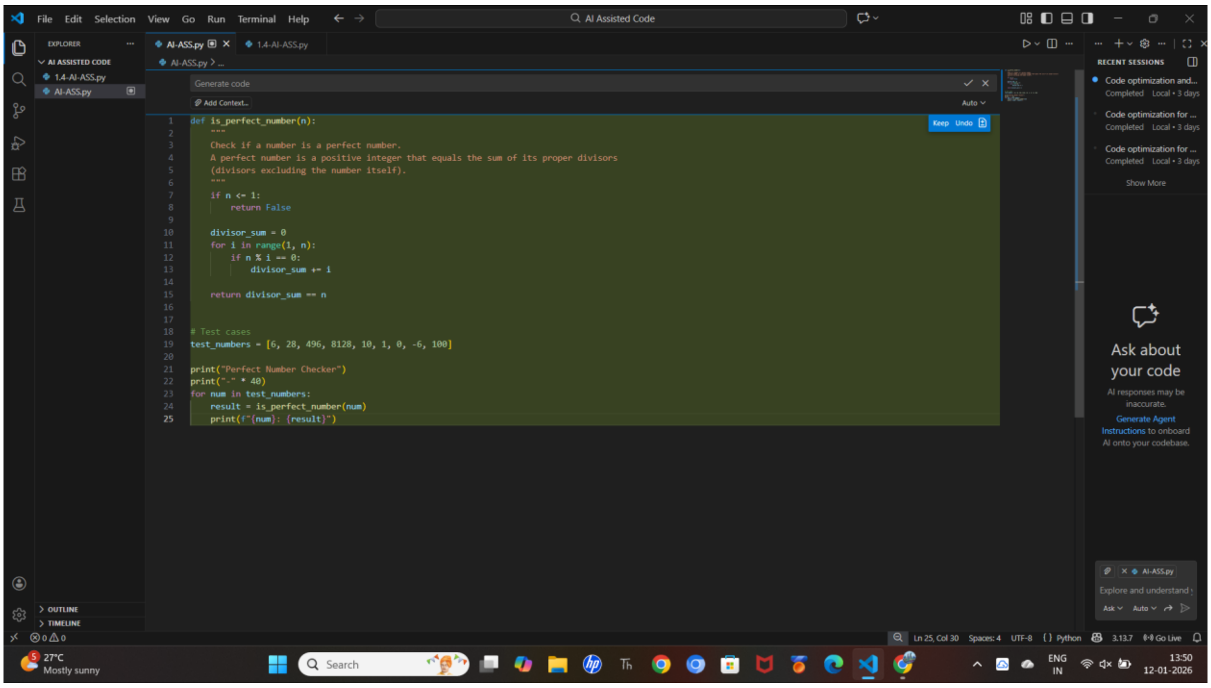
Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a perfect number.

Task:

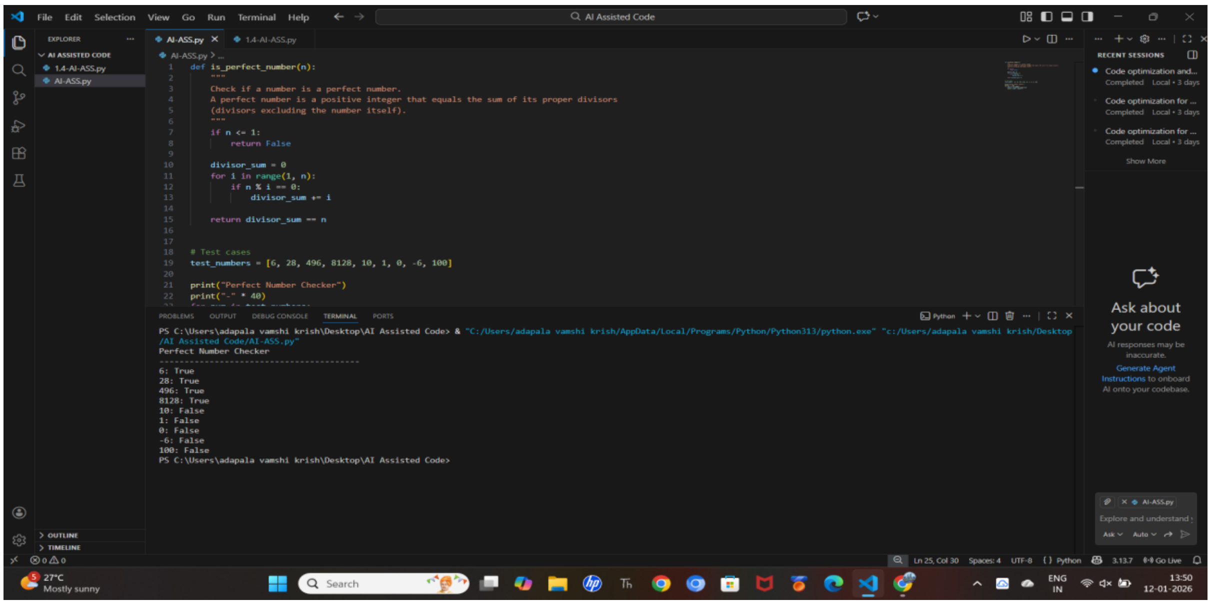
- Record the AI-generated code.
- Test the program with multiple inputs.
- Identify any missing conditions or inefficiencies in the logic.

PROMPT: **Perfect Number Check without providing any examples**

CODE:



```python
def is_perfect_number(n):
    """
    Check if a number is a perfect number.
    A perfect number is a positive integer that equals the sum of its proper divisors
    (divisors excluding the number itself).
    """
    if n <= 1:
        return False

    divisor_sum = 0
    for i in range(1, n):
        if n % i == 0:
            divisor_sum += i

    return divisor_sum == n


# Test cases
test_numbers = [6, 28, 496, 8128, 10, 1, 0, -6, 100]

print("Perfect Number Checker")
print("-" * 40)
for num in test_numbers:
    result = is_perfect_number(num)
    print(f"{num}: {result}")
```



```python
def is_perfect_number(n):
    """
    Check if a number is a perfect number.
    A perfect number is a positive integer that equals the sum of its proper divisors
    (divisors excluding the number itself).
    """
    if n <= 1:
        return False

    divisor_sum = 0
    for i in range(1, n):
        if n % i == 0:
            divisor_sum += i

    return divisor_sum == n


# Test cases
test_numbers = [6, 28, 496, 8128, 10, 1, 0, -6, 100]

print("Perfect Number Checker")
print("-" * 40)
```

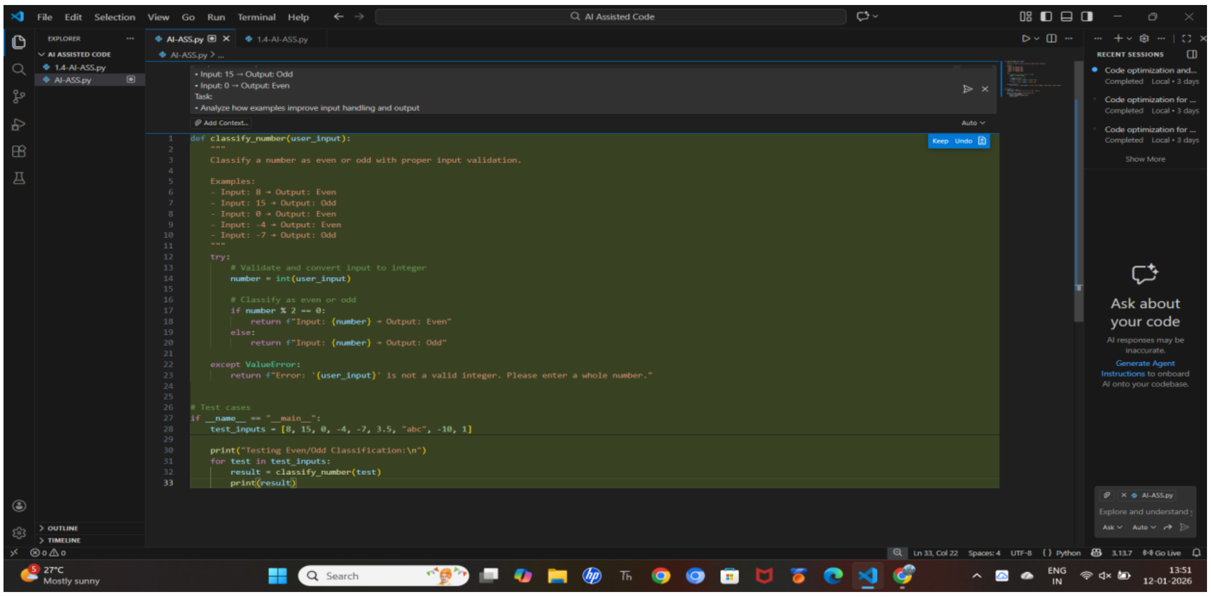
```
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop
/AI Assisted Code/AI-ASS.py"
Perfect Number Checker
----------------------------------------
6: True
28: True
496: True
8128: True
10: False
1: False
0: False
-6: False
100: False
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```

Question 6:   Few-Shot Prompting (Even or Odd Classification with Validation)

Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python program that determines whether a given number is even or odd, including proper input validation.
Examples:
• Input: 8 → Output: Even
• Input: 15 → Output: Odd
• Input: 0 → Output: Even
Task:
• Analyze how examples improve input handling and output clarity.
• Test the program with negative numbers and non-integer inputs.

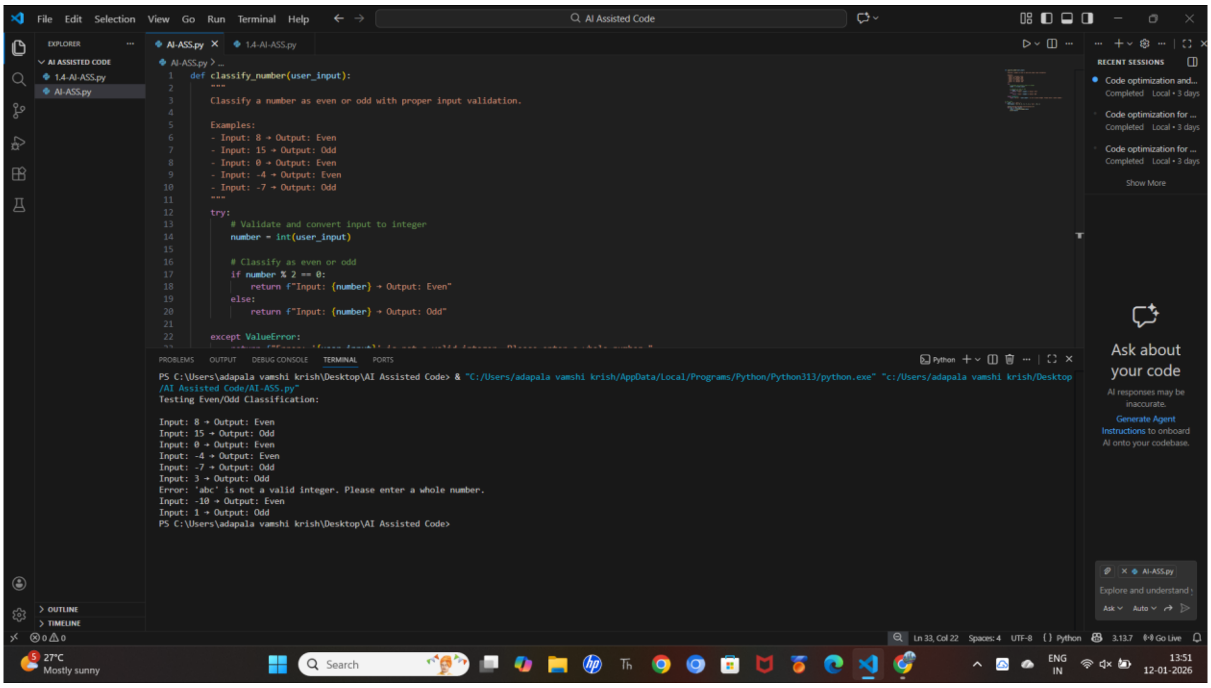
<u>PROMPT</u>:
Even or Odd Classification with Validation
• Input: 8 → Output: Even
• Input: 15 → Output: Odd
• Input: 0 → Output: Even

<u>CODE:</u>



```
• Input: 15 → Output: Odd
• Input: 0 → Output: Even
Task:
• Analyze how examples improve input handling and output
```

```python
def classify_number(user_input):
    """
    Classify a number as even or odd with proper input validation.

    Examples:
    - Input: 8 → Output: Even
    - Input: 15 → Output: Odd
    - Input: 0 → Output: Even
    - Input: -4 → Output: Even
    - Input: -7 → Output: Odd
    """
    try:
        # Validate and convert input to integer
        number = int(user_input)

        # Classify as even or odd
        if number % 2 == 0:
            return f"Input: {number} → Output: Even"
        else:
            return f"Input: {number} → Output: Odd"

    except ValueError:
        return f"Error: '{user_input}' is not a valid integer. Please enter a whole number."


# Test cases
if __name__ == "__main__":
    test_inputs = [8, 15, 0, -4, -7, 3.5, "abc", -10, 1]

    print("Testing Even/Odd Classification:\n")
    for test in test_inputs:
        result = classify_number(test)
        print(result)
```



```python
def classify_number(user_input):
    """
    Classify a number as even or odd with proper input validation.

    Examples:
    - Input: 8 → Output: Even
    - Input: 15 → Output: Odd
    - Input: 0 → Output: Even
    - Input: -4 → Output: Even
    - Input: -7 → Output: Odd
    """
    try:
        # Validate and convert input to integer
        number = int(user_input)

        # Classify as even or odd
        if number % 2 == 0:
            return f"Input: {number} → Output: Even"
        else:
            return f"Input: {number} → Output: Odd"

    except ValueError:
```

```
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code> & "C:/Users/adapala vamshi krish/AppData/Local/Programs/Python/Python313/python.exe" "c:/Users/adapala vamshi krish/Desktop
/AI Assisted Code/AI-ASS.py"
Testing Even/Odd Classification:

Input: 8 → Output: Even
Input: 15 → Output: Odd
Input: 0 → Output: Even
Input: -4 → Output: Even
Input: -7 → Output: Odd
Input: 3 → Output: Odd
Error: 'abc' is not a valid integer. Please enter a whole number.
Input: -10 → Output: Even
Input: 1 → Output: Odd
PS C:\Users\adapala vamshi krish\Desktop\AI Assisted Code>
```