

Varun

2403A53L02 – 46 batch

SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
Program Name:	B. Tech	Assignment Type:	Lab
Course Coordinator Name	Dr. Rishabh Mittal		
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CourseCode	23CS002PC304	Course Title	AI Assisted Coding
Year/Sem	III/II	Regulation	R23
Date and Day of Assignment	Week2 – Monday	Time(s)	23CSBTB01 To 23CSBTB52
Duration	2 Hours	Applicable to Batches	All batches
Assignment Number: 3.1(Present assignment number)/24(Total number of assignments)			

Q.No.	Question	Expected Time to complete
1	Lab Experiment: Prompt Engineering – Improving Prompts and	Week2 - Monday

	<p>Context Management</p>	
	<p>Lab Objectives</p> <ol style="list-style-type: none"> 1. To understand and apply different prompt engineering techniques for generating Python programs using AI-assisted tools. 2. To analyze the impact of context and examples on the accuracy and efficiency of AI-generated code. 3. To develop and refine real-world Python applications through iterative prompt improvement. 	
	<p>Lab Outcomes</p> <ol style="list-style-type: none"> 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 and document real-world Python applications using AI-assisted coding tools. 	
	<p>Experiment – Prompt Engineering Techniques</p> <p>Task Description</p> <p>Design and refine prompts using different prompting strategies to generate Python programs for basic computational problems.</p>	
	<p>Question 1: Zero-Shot Prompting (Palindrome Number Program)</p> <p>Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a palindrome.</p> <p>Task:</p> <ul style="list-style-type: none"> • Record the AI-generated code. • Test the code with multiple inputs. • Identify any logical errors or missing edge-case handling. 	

Zero-Shot Prompt:

Write a Python function that takes an integer as input and returns True if the number is a palindrome and False otherwise. The function should not convert the number to a string and should handle edge cases correctly.

Code:

```
1  def is_palindrome(num):
2      if num < 0:
3          return False
4
5      original = num
6      reversed_num = 0
7
8      while num > 0:
9          digit = num % 10
10         reversed_num = reversed_num * 10 + digit
11         num //= 10
12
13     return original == reversed_num
14
15 test_cases = [
16     121,           # palindrome
17     12321,         # palindrome
18     123,           # not palindrome
19     10,            # not palindrome
20 ]
```

Output:

```
OUTPUT PROBLEMS PORTS SPELL CHECKER DEBUG CONSOLE TERMINAL
● PS C:\Users\shaik\Downloads\Projects-source_code\python-PD> python -u "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py"
121 True
12321 True
123 False
10 False
* PS C:\Users\shaik\Downloads\Projects-source_code\python-PD>
```

```
14     is_palindrome(12.21)    # breaks logic
15     is_palindrome("121")   # TypeError
16     is_palindrome(010)    # invalid in Python, but conceptually ambiguous
17

OUTPUT PROBLEMS PORTS SPELL CHECKER DEBUG CONSOLE TERMINAL
PS C:\Users\shaik\Downloads\Projects-source_code\python-PD> python -u "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py"
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 17
    is_palindrome(010)    # invalid in Python, but conceptually ambiguous
                  ^
SyntaxError: leading zeros in decimal integer literals are not permitted; use an 0o prefix for octal integers
PS C:\Users\shaik\Downloads\Projects-source_code\python-PD>
```

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.

```
basic.py > ...
1  def factorial(n):
2      if n == 0:
3          return 1
4      return n * factorial(n - 1)
5
```

```

basic.py > factorial
1 def factorial(n):
2     """
3         Computes the factorial of a non-negative integer n.
4         Example: factorial(5) -> 120
5     """
6     if not isinstance(n, int):
7         raise TypeError("Input must be an integer")
8     if n < 0:
9         raise ValueError("Factorial is not defined for negative numbers")
10
11    result = 1
12    for i in range(1, n + 1):
13        result *= i
14
15    return result

```

Comparison: Zero-Shot vs One-Shot

Aspect	Zero-Shot	One-Shot
Correctness	Partial	Robust
Handles negative input	No	Yes
Handles invalid types	No	Yes
Risk of runtime errors	High	Low
Readability	Basic	Clear & documented
Scalability	Poor (recursion)	Better (iterative)

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.

```
basic.py > ...
1 def is_armstrong(number):
2     """
3         Checks whether a given number is an Armstrong number.
4     """
5     if not isinstance(number, int):
6         raise TypeError("Input must be an integer")
7
8     if number < 0:
9         return "Not an Armstrong Number"
10
11    digits = str(number)
12    power = len(digits)
13    total = sum(int(digit) ** power for digit in digits)
14
15    if total == number:
16        return "Armstrong Number"
17    else:
18        return "Not an Armstrong Number"
19
20
21 print(is_armstrong(0))      # Armstrong Number
22 print(is_armstrong(1))      # Armstrong Number
23 print(is_armstrong(9))      # Armstrong Number
24 print(is_armstrong(9474))   # Armstrong Number (4-digit case)
25
26
27 print(is_armstrong(-153))   # Not an Armstrong Number
28 print(is_armstrong(10))     # Not an Armstrong Number
29 print(is_armstrong(153.0))  # TypeError
30 print(is_armstrong("153"))  # TypeError
31
```

```

PS C:\Users\shaik\Downloads\Projects-source_code\python-PD> python -u "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py"
④ Armstrong Number
Armstrong Number
Armstrong Number
Armstrong Number
Armstrong Number
Not an Armstrong Number
Not an Armstrong Number
Traceback (most recent call last):
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 29, in <module>
    print(is_armstrong(153.0))  # TypeError
                                ~~~~~
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 6, in is_armstrong
    raise TypeError("Input must be an integer")
Armstrong Number
④ Armstrong Number
Armstrong Number
Not an Armstrong Number
Not an Armstrong Number
Traceback (most recent call last):
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 29, in <module>
    print(is_armstrong(153.0))  # TypeError
                                ~~~~~
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 6, in is_armstrong
    raise TypeError("Input must be an integer")
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 29, in <module>
    print(is_armstrong(153.0))  # TypeError
                                ~~~~~
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 6, in is_armstrong
    raise TypeError("Input must be an integer")
    raise TypeError("Input must be an integer")
    raise TypeError("Input must be an integer")
TypeError: Input must be an integer
PS C:\Users\shaik\Downloads\Projects-source_code\python-PD>

```

(Optional Extension)

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.

Context-Managed Prompt:

You are a Python developer writing production-quality code.

Task: Write an **optimized Python program** that classifies a given number as:

- **Prime**
- **Composite**

- **Neither prime nor composite**

Constraints:

- Accept **only integers** as valid input
- Handle **negative numbers, 0, and 1 correctly**
- Optimize for performance (avoid unnecessary iterations)
- Return clear, human-readable output
- Code must be readable, efficient, and safe for large inputs

```
basic.py > ...
1 def classify_number(n):
2     """
3         Classifies a number as Prime, Composite, or Neither.
4     """
5
6     if not isinstance(n, int):
7         raise TypeError("Input must be an integer")
8
9     if n <= 1:
10        return "Neither prime nor composite"
11
12    if n == 2:
13        return "Prime"
14
15    if n % 2 == 0:
16        return "Composite"
17
18    limit = int(n ** 0.5) + 1
19    for i in range(3, limit, 2):
20        if n % i == 0:
21            return "Composite"
22
23    return "Prime"
24 def fibonnaci(n):
```

```
basic.py > is_prime
1 def is_prime(n):
2     for i in range(2, n):
3         if n % i == 0:
4             return False
5     return True
6
```

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.

```
basic.py > ...
1 def is_perfect(n):
2     total = 0
3     for i in range(1, n):
4         if n % i == 0:
5             total += i
6     return total == n
7
8 print(is_perfect(6))      # Expected: True
9 print(is_perfect(28))      # Expected: True
10 print(is_perfect(12))     # Expected: False
11 print(is_perfect(1))      # Expected: False
12 print(is_perfect(0))      # Expected: False
13 print(is_perfect(-6))     # Expected: False
14 |
```

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

```
basic.py > ...
1  def classify_even_odd(n):
2      """
3          Determines whether a number is Even or Odd.
4      """
5
6      if not isinstance(n, int):
7          raise TypeError("Input must be an integer")
8
9      if n % 2 == 0:
10         return "Even"
11     else:
12         return "Odd"
13
14 print(classify_even_odd(-4))    # Even
15 print(classify_even_odd(-7))    # Odd
16
17 print(classify_even_odd(3.5))   # TypeError
18 print(classify_even_odd("10"))  # TypeError
19 print(classify_even_odd(True)) # TypeError
20
```

```
OUTPUT PROBLEMS PORTS SPELL CHECKER DEBUG CONSOLE TERMINAL
PS C:\Users\shaik\Downloads\Projects-source_code\python-PD> python -u "c:\users\shaik\Downloads\Projects-source_code\python-PD\basic.py"
❸ Even
Odd
Traceback (most recent call last):
  File "c:\users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 17, in <module>
    print(classify_even_odd(3.5))    # TypeError
                                     ^
                                     ^
                                     file "c:\users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 7, in classify_even_odd
                                         raise TypeError("Input must be an integer")
                                         ^
                                         TypeError: Input must be an integer
❹ PS C:\Users\shaik\Downloads\Projects-source_code\python-PD>
```