

Varun

2403A53L02 – 46 batch

SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
Program Name: B. Tech		Assignment Type: Lab	Academic Year:2025-2026
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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. 	
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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
15 is_palindrome(12.21) # breaks logic
16 is_palindrome("121") # TypeError
17 is_palindrome(010) # invalid in Python, but conceptually ambiguous
```

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     return result
15

```

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\bas
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")
TypeError: Input must be an integer
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")
  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 6, in is_armstrong
    raise TypeError("Input must be an integer")
  File "c:\Users\shaik\Downloads\Projects-source_code\python-PD\basic.py", line 6, in is_armstrong
    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
```

```
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"
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
PS C:\Users\shaik\Downloads\Projects-source_code\python-PD>

```