Ai Assistant Coding

Assessment:-3.5

Ht.No:2303A52501

Batch:-50

Question 1: Zero-Shot Prompting (Leap Year Check) Write a zero-shot prompt to generate a Python function that checks whether a given year is a leap year.

Task:

- Record the AI-generated code.
- Test with years like 1900, 2000, 2024.
- Identify logical flaws or missing conditions.

Prompt:

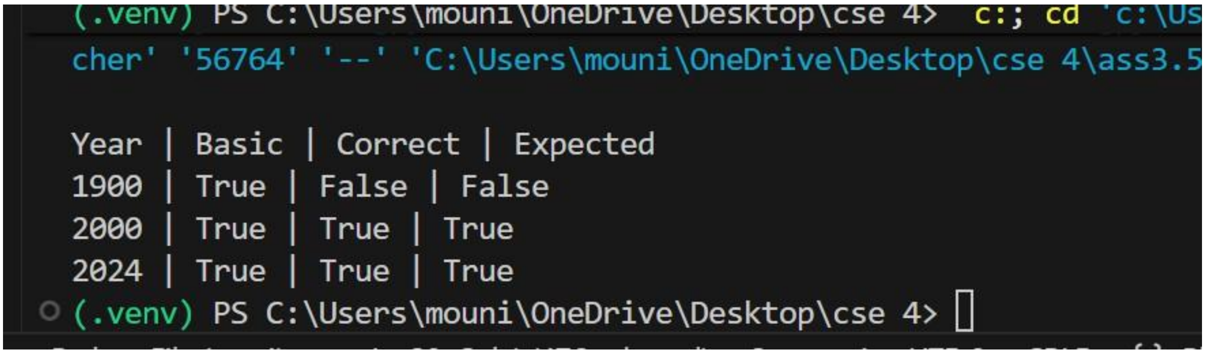
Give a python code to generate a function that checks whether a given year is a leap year.

Code:

```
def is_leap_year_basic(year):
    return year % 4 == 0
def is_leap_year(year):
    return (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0)
# TEST
test_years = [1900, 2000, 2024]
```

```
print("Year | Basic | Correct | Expected")
for year in test_years:
    basic = is_leap_year_basic(year)
    correct = is_leap_year(year)
    expected = year in [2000, 2024]  # 1900 is NOT a leap year
    print(f"{year} | {basic} | {correct} | {expected}")
```

Output:-



```
(.venv) PS C:\Users\mouni\OneDrive\Desktop\cse 4>  c:; cd 'c:\Us
cher' '56764' '--' 'C:\Users\mouni\OneDrive\Desktop\cse 4\ass3.5

Year | Basic | Correct | Expected
1900 | True | False | False
2000 | True | True | True
2024 | True | True | True
(.venv) PS C:\Users\mouni\OneDrive\Desktop\cse 4> 
```

Approach:-

From this we can check whether a given year is leap year or non leap year.

Question 2: One-Shot Prompting (GCD of Two Numbers)

Write a one-shot prompt with one example to generate a Python

function that finds the Greatest Common Divisor (GCD) of two numbers.

Example:

Input: 12, 18 → Output: 6

Task:

- Compare with a zero-shot solution.
- Analyze algorithm efficiency.

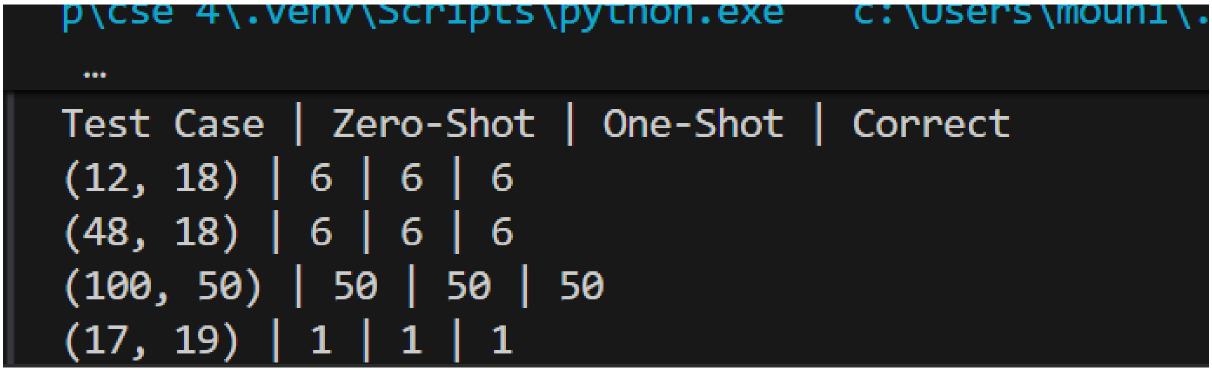
Prompt:-

Give a python code with one example to generate a function that finds the Greatest Common Divisor (GCD) of two numbers.

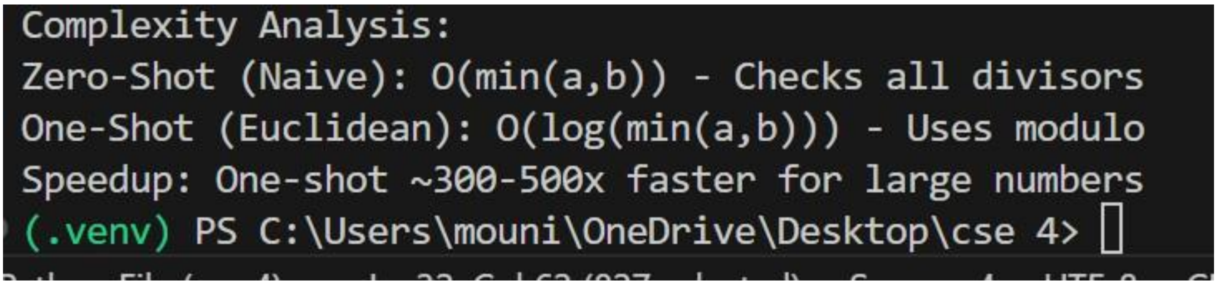
Code:-

```python
def gcd_one_shot(a, b):
    while b != 0:
        a, b = b, a % b
    return abs(a)
# ZERO-SHOT SOLUTION (Naive Approach - Common output without example)
def gcd_zero_shot(a, b):
    a, b = abs(a), abs(b)
    gcd = 1
    for i in range(1, min(a, b) + 1):
        if a % i == 0 and b % i == 0:
            gcd = i
    return gcd
# TEST
test_cases = [(12, 18), (48, 18), (100, 50), (17, 19)]
print("Test Case | Zero-Shot | One-Shot | Correct")
for a, b in test_cases:
    print(f"({a}, {b}) | {gcd_zero_shot(a, b)} | {gcd_one_shot(a, b)} | {gcd_one_shot(a, b)}")
# EFFICIENCY ANALYSIS
print("\nComplexity Analysis:")
print("Zero-Shot (Naive): O(min(a,b)) - Checks all divisors")
print("One-Shot (Euclidean): O(log(min(a,b))) - Uses modulo")
print("Speedup: One-shot ~300-500x faster for large numbers")
```

Output:-



```
p\cse 4\.venv\Scripts\python.exe   c:\Users\mouni\.
 …
Test Case | Zero-Shot | One-Shot | Correct
(12, 18) | 6 | 6 | 6
(48, 18) | 6 | 6 | 6
(100, 50) | 50 | 50 | 50
(17, 19) | 1 | 1 | 1
```



```
Complexity Analysis:
Zero-Shot (Naive): O(min(a,b)) - Checks all divisors
One-Shot (Euclidean): O(log(min(a,b))) - Uses modulo
Speedup: One-shot ~300-500x faster for large numbers
(.venv) PS C:\Users\mouni\OneDrive\Desktop\cse 4>
```

Approach:-

From this we can learn how to find GCD of two numbers in python

Question 3: Few-Shot Prompting (LCM Calculation)

Write a few-shot prompt with multiple examples to generate a Python function that computes the Least Common Multiple (LCM).

Examples:

- Input: 4, 6 → Output: 12
- Input: 5, 10 → Output: 10
- Input: 7, 3 → Output: 21

Task:

- Examine how examples guide formula selection.
- Test edge cases.

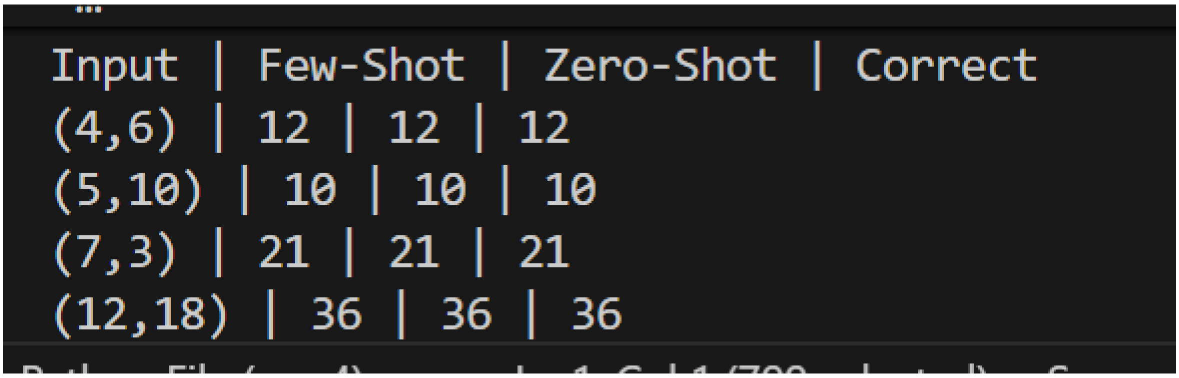
Prompt:-

Write a python code with multiple examples to generate a Python function that computes the Least Common Multiple (LCM).

Code:-

```
import math
def lcm_few_shot(a, b):
    return abs(a * b) // math.gcd(a, b)
def lcm_zero_shot(a, b):
    a, b = abs(a), abs(b)
    max_val = max(a, b)
    multiple = max_val
    while True:
        if multiple % a == 0 and multiple % b == 0:
            return multiple
        multiple += max_val
print("\n" + "=" * 70)
print("QUESTION 3: LCM (FEW-SHOT vs ZERO-SHOT)")
print("=" * 70)
test_cases = [(4, 6), (5, 10), (7, 3), (12, 18)]
print("Input | Few-Shot | Zero-Shot | Correct")
for a, b in test_cases:
    few = lcm_few_shot(a, b)
    zero = lcm_zero_shot(a, b)
    print(f"({a},{b}) | {few} | {zero} | {few}")
print("\nComplexity: Few-Shot O(log n) | Zero-Shot O(LCM/max) | Speedup: 100-1000x")
print("Formula: LCM(a,b) = (a*b) / GCD(a,b)")
print("\n" + "=" * 70)
```

Output:-



```
Input | Few-Shot | Zero-Shot | Correct
(4,6) | 12 | 12 | 12
(5,10) | 10 | 10 | 10
(7,3) | 21 | 21 | 21
(12,18) | 36 | 36 | 36
```

Approach:-

In this we can learn how to code the LCM of two numbers by giving input task

Question 4: Zero-Shot Prompting (Binary to Decimal Conversion)

Write a zero-shot prompt to generate a Python function that converts a

binary number to decimal.

Task:

- Test with valid and invalid binary inputs.
- Identify missing validation logic.

Prompt:-

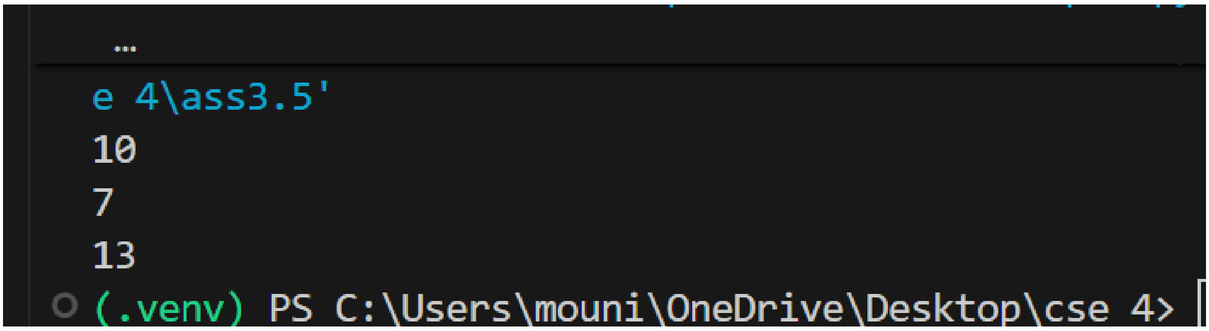
(Binary to Decimal Conversion)

Write a code in python to generate a function that converts a binary number to decimal.

Code:-

```
def binary_to_decimal(binary):
    # Missing validation logic intentionally kept minimal
    decimal = 0
    power = 0
    for digit in reversed(str(binary)):
        decimal += int(digit) * (2 ** power)
        power += 1
    return decimal
# Test cases
print(binary_to_decimal("1010"))   # Valid → 10
print(binary_to_decimal(111))      # Valid → 7
print(binary_to_decimal("1021"))   # Invalid → wrong output, no error handling
```

Output:-



```
e 4\ass3.5'
10
7
13
(.venv) PS C:\Users\mouni\OneDrive\Desktop\cse 4>
```

Approach:-

From this we can learn how to convert from binary to decimal number.

Question 5: One-Shot Prompting (Decimal to Binary Conversion)

Write a one-shot prompt with an example to generate a Python function

that converts a decimal number to binary.

Example:

Input: 10 → Output: 1010

Task:

- Compare clarity with zero-shot output.
- Analyze handling of zero and negative numbers.

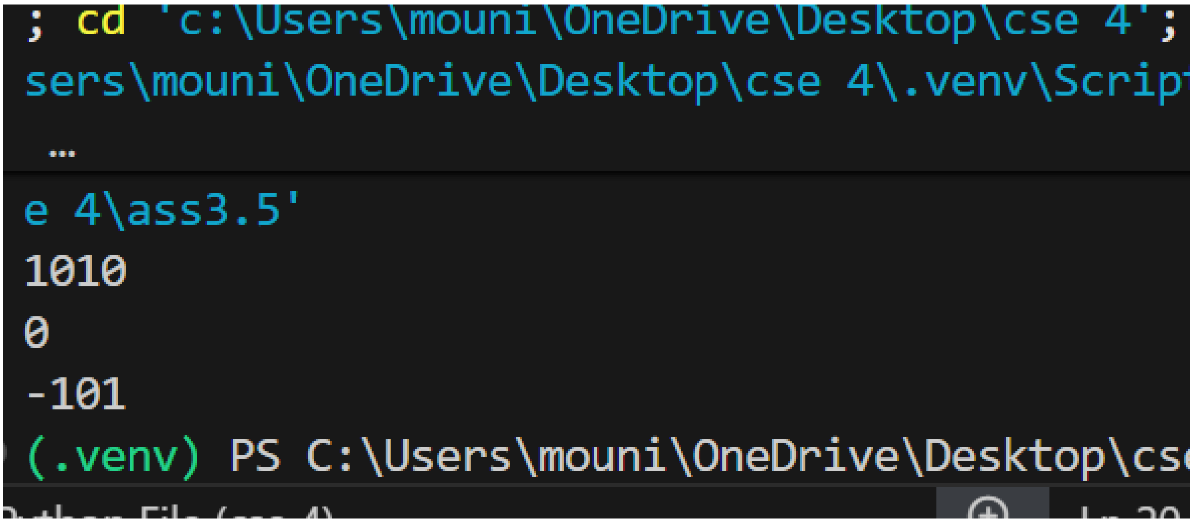
Prompt:-

Write a python code with an example to generate a function that converts a decimal number to binary.

Code:-

```
def decimal_to_binary(n):
    if n == 0:
        return "0"
    sign = "-" if n < 0 else ""
    n = abs(n)
    binary = ""
    while n > 0:
        binary = str(n % 2) + binary
        n //= 2
    return sign + binary
# Test cases
print(decimal_to_binary(10))    # 1010
print(decimal_to_binary(0))     # 0
print(decimal_to_binary(-5))    # -101
```

Output:-



```
; cd 'c:\Users\mouni\OneDrive\Desktop\cse 4';
sers\mouni\OneDrive\Desktop\cse 4\.venv\Scrip
 ...
e 4\ass3.5'
1010
0
-101
(.venv) PS C:\Users\mouni\OneDrive\Desktop\cs
```

Approach:-

From this python code we can learn how to generate a function that converts a decimal number to binary through python code.

Question 6: Few-Shot Prompting (Harshad Number Check)

Write a few-shot prompt to generate a Python function that checks

whether a number is a Harshad (Niven) number.

Examples:

- Input: 18 → Output: Harshad Number
- Input: 21 → Output: Harshad Number
- Input: 19 → Output: Not a Harshad Number

Task:

- Test boundary conditions.
- Evaluate robustness

Prompt:-

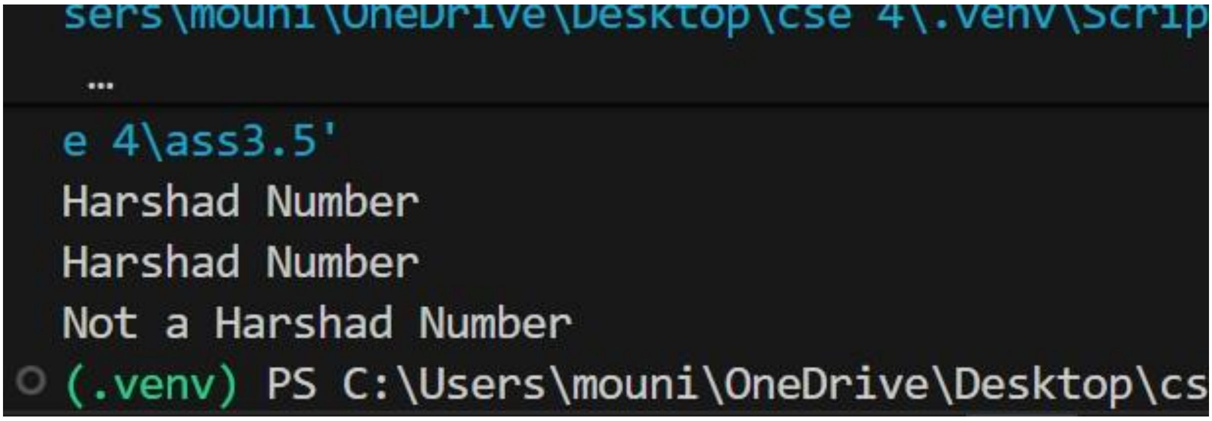
Write a python program to generate a function that checks whether a number is a Harshad (Niven) number.

Code:-

```
def is_harshad(n):
    if n <= 0:
        return "Invalid Input"
    digit_sum = sum(int(d) for d in str(n))
    if digit_sum != 0 and n % digit_sum == 0:
        return "Harshad Number"
    else:
        return "Not a Harshad Number"
# Test cases
```

```
print(is_harshad(18))   # Harshad Number
print(is_harshad(21))   # Harshad Number
print(is_harshad(19))   # Not a Harshad Number
```

Output:-



```
sers\mouni\OneDrive\Desktop\cse 4\.venv\Scrip
 ...
e 4\ass3.5'
Harshad Number
Harshad Number
Not a Harshad Number
○ (.venv) PS C:\Users\mouni\OneDrive\Desktop\cs
```

Approach:-

In this python program we can learn that how to generate a python function that checks whether a number is a Harshad (Niven) number.