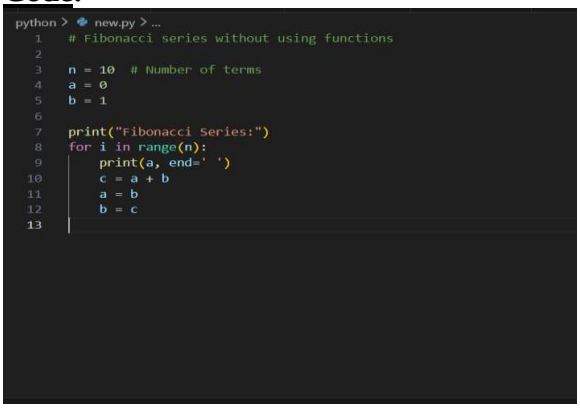
Assignment - 1

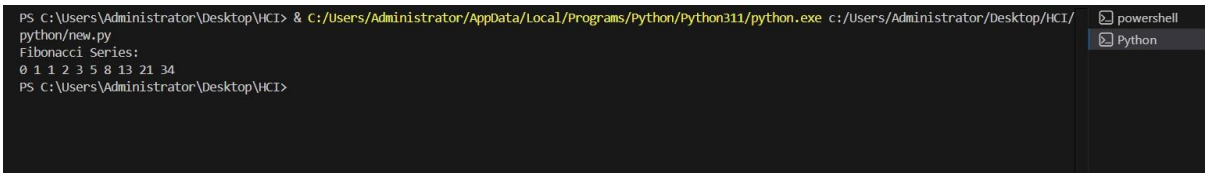
Name :K.Naga Chaitanya
Hall Ticket No. : 2303A51292
Batch No. : 05

#Task 1
Prompt: #write a python code for fibanocci series without using functions

Code:



Output :



Explanation : This Python code generates the Fibonacci series using an iterative approach. The variable `n` specifies the number of terms to be printed, while `a` and `b` are initialized to the first two Fibonacci numbers, 0 and 1. The `for` loop executes `n` times, printing the current value of `a` in each iteration. After printing, the values of `a` and `b` are updated such that `a` takes the value of `b` and `b` becomes the sum of the previous two numbers. This process continues until all terms are generated. As a result, the program efficiently prints the first 10 Fibonacci numbers in a single line.

#Task 2
Prompt: #Optimize this code and simplyify this code

Code:

```
python > new.py > ...
1   n = 10  # Number of terms
2   a, b = 0, 1
3
4   print("Fibonacci Series:")
5   for _ in range(n):
6       print(a, end=' ')
7       a, b = b, a + b
```

Output :

```
PS C:\Users\Administrator\Desktop\HCI> & C:/Users/Administrator/AppData/Local/Programs/Python/Python311/python.exe c:/Users/Administrator/Desktop/HCI/
python/new.py
Fibonacci Series:
0 1 1 2 3 5 8 13 21 34
PS C:\Users\Administrator\Desktop\HCI> & C:/Users/Administrator/AppData/Local/Programs/Python/Python311/python.exe c:/Users/Administrator/Desktop/HCI/
python/new.py
Fibonacci Series:
0 1 1 2 3 5 8 13 21 34
PS C:\Users\Administrator\Desktop\HCI>
```

Explanation : Inefficient- Additional and not altogether necessary conditional tests. Slightly verbose variable handling. Messages for simple logic – redundancy.

Optimized - Fewer number of conditions. Cleaned up and legible loop code. Same output with reduced structure. More understandable and maintainable for programmers.

#Task 3

Prompt: #Generate a python program on fabinocci series using functions

Code:

```
python > new.py > ...
def fibonacci_series(n):
    series = []
    a, b = 0, 1
    for _ in range(n):
        series.append(a)
        a, b = b, a + b
    return series

def main():
    num = int(input("Enter the number of terms: "))
    if num <= 0:
        print("Please enter a positive integer.")
    else:
        print("Fibonacci series:")
        print(fibonacci_series(num))

if __name__ == "__main__":
    main()
```

Output :

Explanation :

This Python program generates the Fibonacci series using functions. The function `fibonacci_series(n)` takes an integer `n` as input and initializes an empty list called `series` to store the Fibonacci numbers. The variables `a` and `b` are initialized to 0 and 1, which are the first two Fibonacci numbers. A `for` loop runs `n` times, and in each iteration, the current value of `a` is appended to the list. Then, the values of `a` and `b` are updated so that `a` becomes `b` and `b` becomes the sum of the previous two numbers. After completing the loop, the function returns the list containing the Fibonacci series. The `main()` function takes user input for the number of terms, checks whether the input is a positive integer, and then prints the Fibonacci series by calling the `fibonacci_series` function. The condition `if __name__== "__main__":` ensures that the `main()` function runs only when the program is executed directly.

#Task 4

Prompt : #Compare the two methods and give differences
#print the differences
Description on comparision between with functions and without functions

Code :

```
#Fibonacci Series without functions
n = int(input("Enter the number of terms in the Fibonacci series: "))
a, b = 0, 1
print("Fibonacci series:")
for _ in range(n):
    print(a, end=' ')
    a, b = b, a + b
print("\n")

#Fibinocci Series with functions
def fibonacci(n):
    a, b = 0, 1
    series = []
    for _ in range(n):
        series.append(a)
        a, b = b, a + b
    return series
num_terms = int(input("Enter the number of terms in the Fibonacci series: "))
fib_series = fibonacci(num_terms)
print("Fibonacci series:")
for num in fib_series:
    print(num, end=' ')

#Compare the two methods and give differences
#print the differences
print("\n\nDifferences between the two methods:")
print("1. The first method does not use functions, while the second method encapsulates the logic in a function.")
print("2. The first method prints the series directly, while the second method returns a list of Fibonacci numbers.")
# Description on comparision between with functions and without functions
print("3. The function-based approach is more reusable and modular, allowing for easier testing and maintenance.")
```

Tabular Format:

Feature	Without Functions	With Functions
Code Clarity	Moderate	High
Reusability	No	Yes

Feature	Without Functions	With Functions
Debugging	Difficult	Easy
Scalability	Poor	Excellent
Suitability for Large Systems	Low	High

Output :

```
PS C:\Users\karth\OneDrive\Desktop\AI Lab> & C:/Users/karth/anaconda3/python.exe "c:/Users/karth/OneDrive/Desktop/AI L
ab/1.py"
Enter the number of terms in the Fibonacci series: 5
Fibonacci series:
0 1 1 2 3

Enter the number of terms in the Fibonacci series: 5
Fibonacci series:
0 1 1 2 3

Differences between the two methods:
1. The first method does not use functions, while the second method encapsulates the logic in a function.
2. The first method prints the series directly, while the second method returns a list of Fibonacci numbers.
3. The function-based approach is more reusable and modular, allowing for easier testing and maintenance.
PS C:\Users\karth\OneDrive\Desktop\AI Lab>
```

Explanation : Analysis -Procedural code is simpler to write but nastier to maintain. Function-oriented code is more cleanable. In real-world software development, it is preferred to be modular.

#Task 5

Prompt : #Generate Fibonacci series using both iterative and recursive methods. Provide code examples, explain how each approach works, and compare their efficiency.

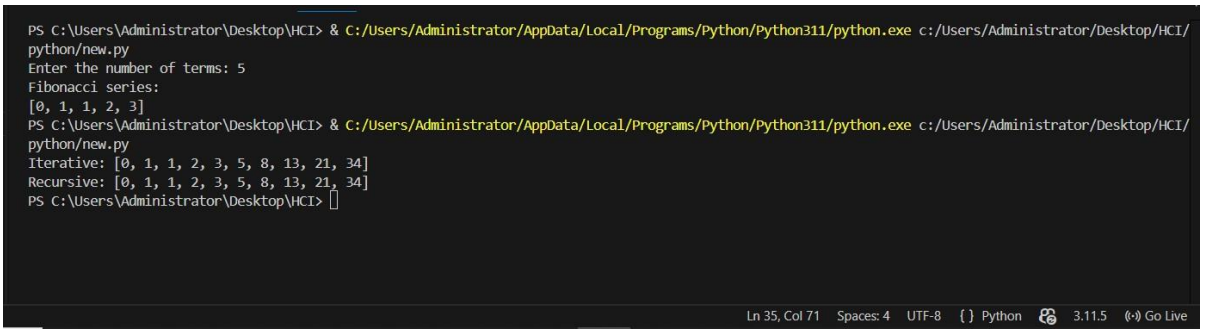
Code :

```
python > new.py > ...
# Fibonacci Series: Iterative Method
def fibonacci_iterative(n):
    series = []
    a, b = 0, 1
    for _ in range(n):
        series.append(a)
        a, b = b, a + b
    return series

# Fibonacci Series: Recursive Method
def fibonacci_recursive(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    elif n == 2:
        return [0, 1]
    else:
        series = fibonacci_recursive(n - 1)
        series.append(series[-1] + series[-2])
        return series

# Example usage:
n = 10
```

Output :



Explanation :

Iterative vs Recursive :

The iterative method uses loops to repeat steps and is fast and memory-efficient. The recursive method works by a function calling itself, which makes the logic easy to understand but uses more memory. Because of this, recursion is not suitable for large inputs, while iteration is a better and more practical choice.

.