Name:A.Shashidhar H.No:2303A51798 Batch:26

SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE	**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**	
Program Name:B. Tech	**Assignment Type: Lab**	**Academic Year:**2025-2026
Course Coordinator Name	Dr. Rishabh Mittal	
Instructor(s)Name	Mr. S Naresh Kumar Ms. B. Swathi Dr. Sasanko Shekhar Gantayat Mr. Md Sallauddin Dr. Mathivanan Mr. Y Srikanth Ms. N Shilpa Dr. Rishabh Mittal (Coordinator) Dr. R. Prashant Kumar Mr. Ankushavali MD Mr. B Viswanath Ms. Sujitha Reddy Ms. A. Anitha Ms. M.Madhuri Ms. Katherashala Swetha Ms. Velpula sumalatha Mr. Bingi Raju Mr. G. Kranthi	

Course Code	23CS002PC304	**Course Title**	AI Assisted Coding
Year/Sem	III/I	**Regulation**	R23
Date and Day of Assignment	Week 5 - Thursday	**Time(s)**	23CSBTB01 To 23CSBTB52
Duration	2 Hours	**Applicable to Batches**	All Batches

AssignmentNumber:9.4 (Present assignment number)/**24**(Total number of assignments)

Q.No.	Question	*ExpectedTime to complete*
1	**Lab 9 – Documentation Generation: Automatic Documentation and Code**	Week 5

Comments

Lab Objectives

- To use AI-assisted coding tools for generating Python documentation and code comments.
- To apply zero-shot, few-shot, and context-based prompt engineering for documentation creation.
- To practice generating and refining docstrings, inline comments, and module-level documentation.
- To compare outputs from different prompting styles for quality analysis.

Lab Outcomes

- Generate structured code documentation using AI tools
- Apply appropriate documentation styles to different code contexts
- Improve code readability through selective commenting
- Convert informal developer comments into professional documentation
- Analyze and refine AI-generated documentation

Task 1: Auto-Generating Function Documentation in a Shared Codebase

Scenario

You have joined a development team where several utility functions are already implemented, but the code lacks proper documentation. New team members are struggling to understand how these functions should be used.

Task Description

You are given a Python script containing multiple functions without any docstrings.

Using an AI-assisted coding tool:

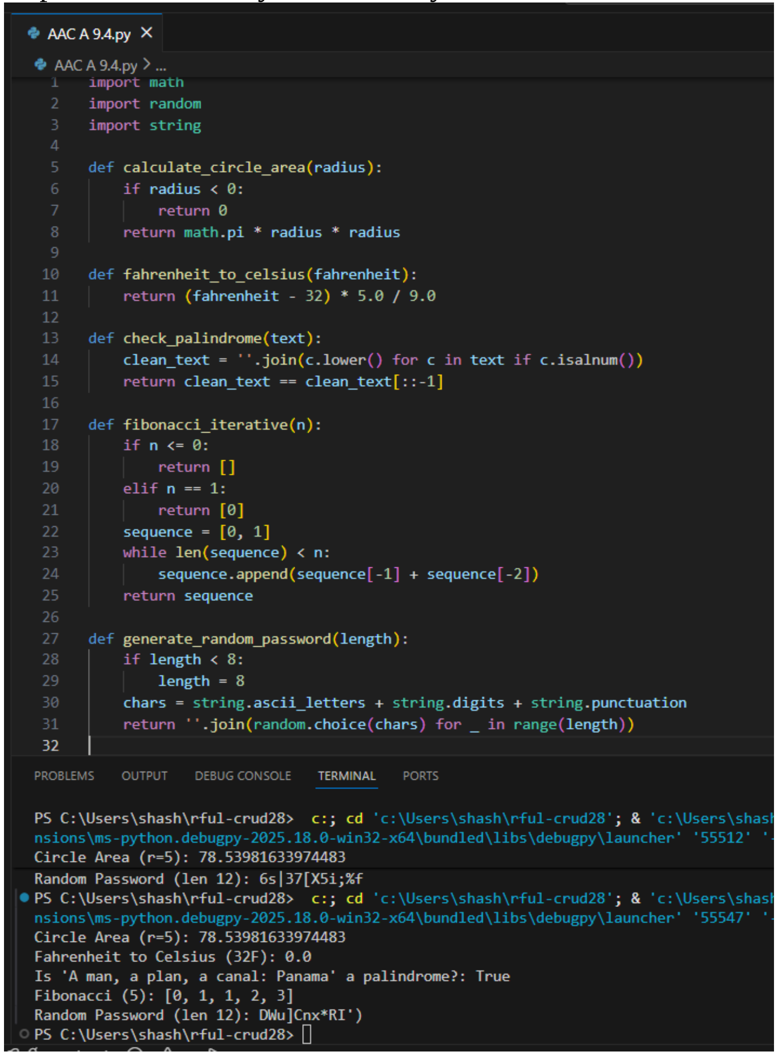
- Ask the AI to automatically generate **Google-style function docstrings** for each function
- Each docstring should include:
  - A brief description of the function
  - Parameters with data types
  - Return values
  - At least one example usage (if applicable)

Experiment with different prompting styles (zero-shot or context-based) to observe quality differences.

Expected Outcome

- A Python script with well-structured Google-style docstrings

- Docstrings that clearly explain function behavior and usage
- Improved readability and usability of the codebase



```python
import math
import random
import string

def calculate_circle_area(radius):
    if radius < 0:
        return 0
    return math.pi * radius * radius

def fahrenheit_to_celsius(fahrenheit):
    return (fahrenheit - 32) * 5.0 / 9.0

def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    sequence = [0, 1]
    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
    chars = string.ascii_letters + string.digits + string.punctuation
    return ''.join(random.choice(chars) for _ in range(length))

```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shas
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Circle Area (r=5): 78.53981633974483
Random Password (len 12): 6s|37[X5i;%f
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Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): DWu]Cnx*RI')
PS C:\Users\shash\rful-crud28> 
```

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Task 2: Enhancing Readability Through AI-Generated Inline Comments

Scenario

A Python program contains complex logic that works correctly but is difficult to understand at first glance. Future maintainers may find it hard to debug or extend this code.

Task Description

You are provided with a Python script containing:

- Loops
- Conditional logic
- Algorithms (such as Fibonacci sequence, sorting, or searching)

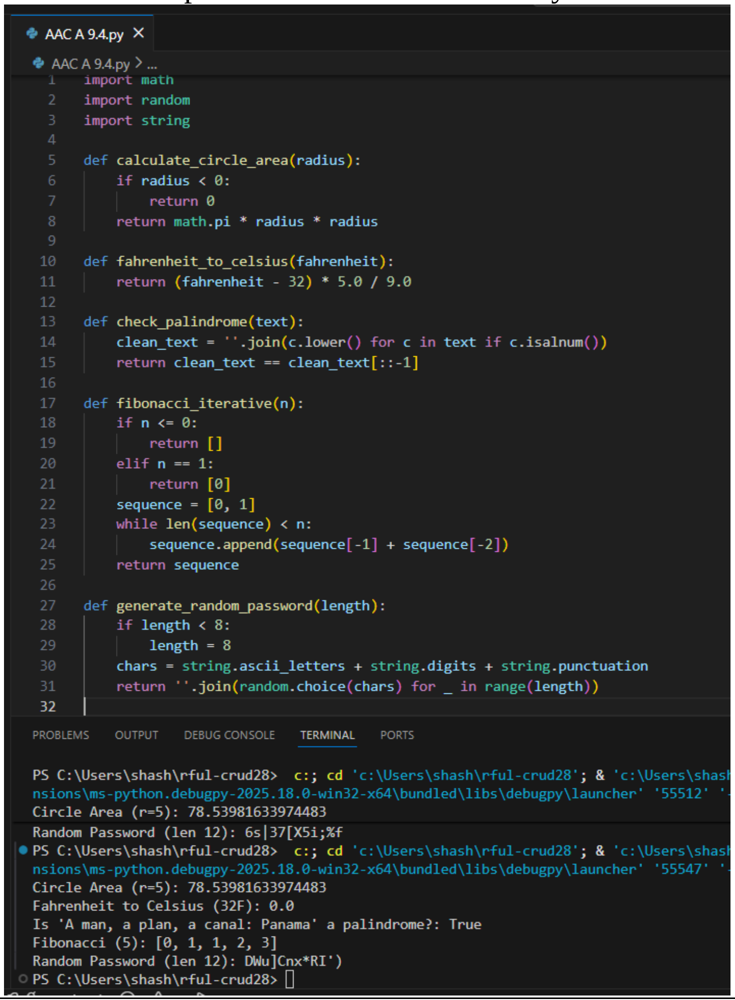
Use AI assistance to:

- Automatically insert **inline comments only for complex or non-obvious logic**
- Avoid commenting on trivial or self-explanatory syntax

The goal is to improve clarity without cluttering the code.

Expected Outcome

- A Python script with concise, meaningful inline comments
- Comments that explain *why* the logic exists, not *what* Python syntax does
- Noticeable improvement in code readability



```python
import math
import random
import string

def calculate_circle_area(radius):
    if radius < 0:
        return 0
    return math.pi * radius * radius

def fahrenheit_to_celsius(fahrenheit):
    return (fahrenheit - 32) * 5.0 / 9.0

def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    sequence = [0, 1]
    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
    chars = string.ascii_letters + string.digits + string.punctuation
    return ''.join(random.choice(chars) for _ in range(length))

```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '55512' '-
Circle Area (r=5): 78.53981633974483
Random Password (len 12): 6s|37[X5i;%f
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '55547' '-
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): DWu]Cnx*RI')
PS C:\Users\shash\rful-crud28> 
```

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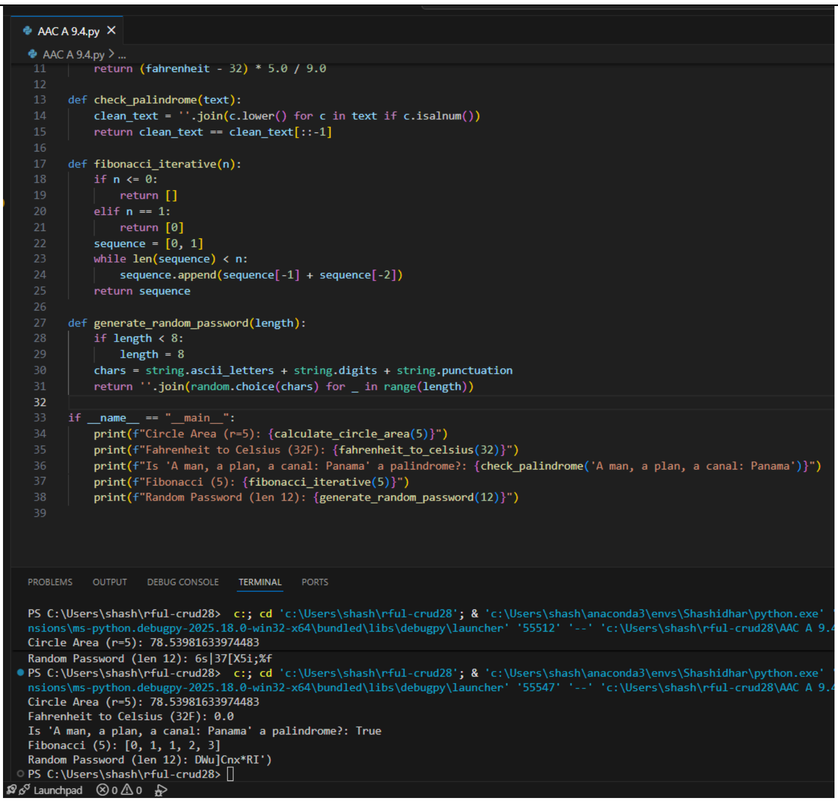
- 

```python
    return (fahrenheit - 32) * 5.0 / 9.0

def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    sequence = [0, 1]
    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
    chars = string.ascii_letters + string.digits + string.punctuation
    return ''.join(random.choice(chars) for _ in range(length))

if __name__ == "__main__":
    print(f"Circle Area (r=5): {calculate_circle_area(5)}")
    print(f"Fahrenheit to Celsius (32F): {fahrenheit_to_celsius(32)}")
    print(f"Is 'A man, a plan, a canal: Panama' a palindrome?: {check_palindrome('A man, a plan, a canal: Panama')}")
    print(f"Fibonacci (5): {fibonacci_iterative(5)}")
    print(f"Random Password (len 12): {generate_random_password(12)}")
```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe'
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '55512' '--' 'c:\Users\shash\rful-crud28\AAC A 9.4
Circle Area (r=5): 78.53981633974483
Random Password (len 12): 6s|37[X5i;%f
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe'
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '55547' '--' 'c:\Users\shash\rful-crud28\AAC A 9.4
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): DWu]Cnx*RI')
PS C:\Users\shash\rful-crud28> 
```

Task 3: Generating Module-Level Documentation for a Python Package

Scenario

Your team is preparing a Python module to be shared internally (or uploaded to a repository). Anyone opening the file should immediately understand its purpose and structure.

Task Description

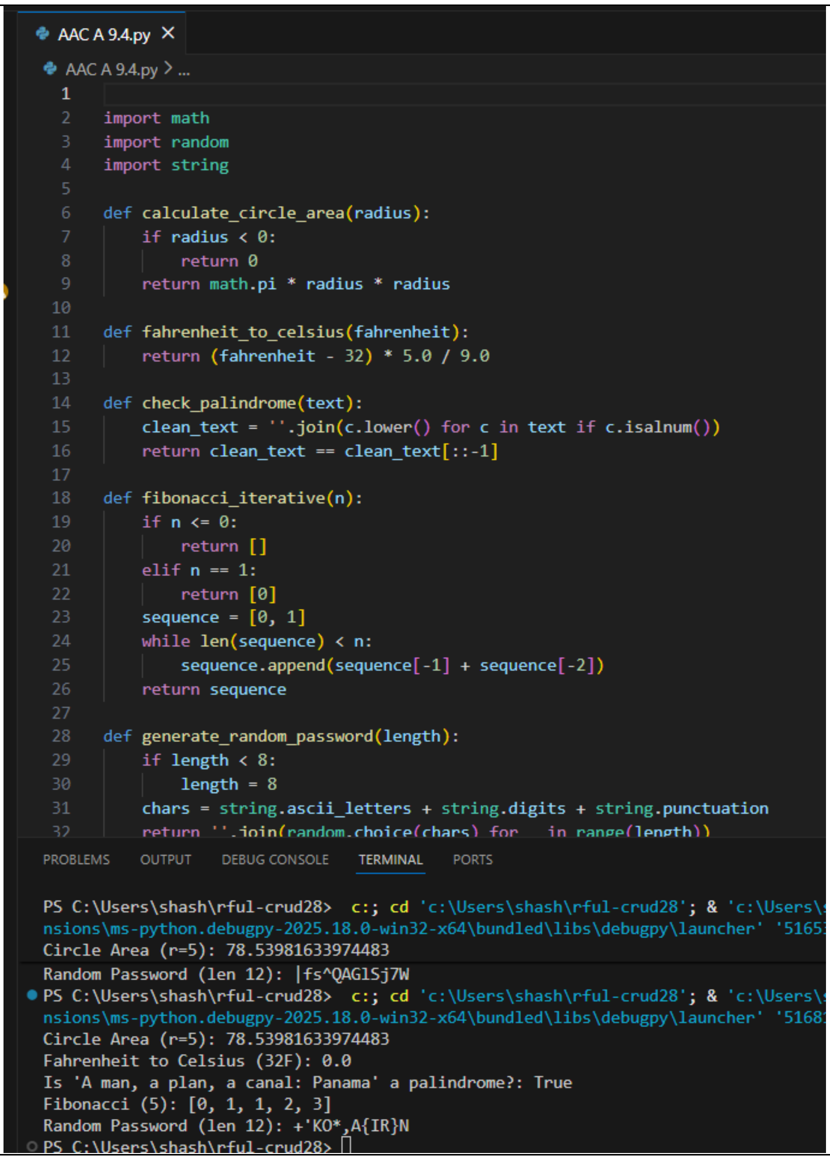
Provide a complete Python module to an AI tool and instruct it to automatically generate a **module-level docstring** at the top of the file that includes:

- The purpose of the module
- Required libraries or dependencies
- A brief description of key functions and classes
- A short example of how the module can be used

Focus on clarity and professional tone.

Expected Outcome

- A well-written multi-line module-level docstring
- Clear overview of what the module does and how to use it
- Documentation suitable for real-world projects or repositories



AAC A 9.4.py

AAC A 9.4.py > ...

```python

import math
import random
import string

def calculate_circle_area(radius):
    if radius < 0:
        return 0
    return math.pi * radius * radius

def fahrenheit_to_celsius(fahrenheit):
    return (fahrenheit - 32) * 5.0 / 9.0

def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    sequence = [0, 1]
    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
    chars = string.ascii_letters + string.digits + string.punctuation
    return ''.join(random.choice(chars) for _ in range(length))
```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\s
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Circle Area (r=5): 78.53981633974483
Random Password (len 12): |fs^QAGlSj7W
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\s
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '5168
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): +'KO*,A{IR}N
PS C:\Users\shash\rful-crud28>
```

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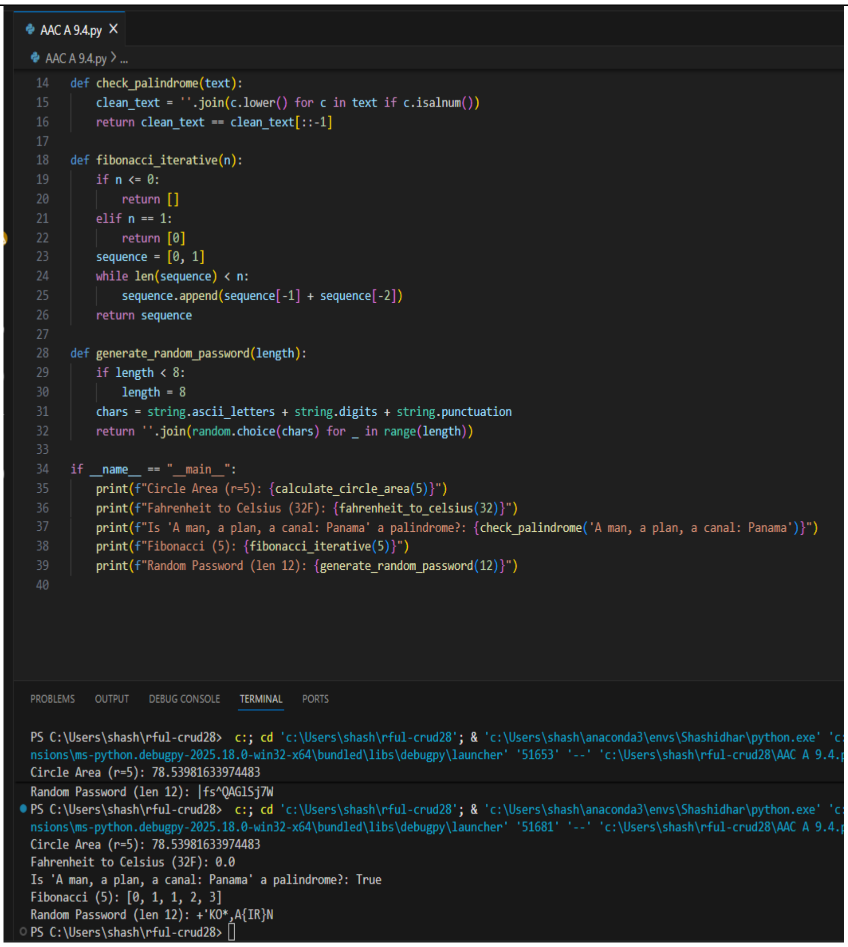


```python
def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]
    sequence = [0, 1]
    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
    chars = string.ascii_letters + string.digits + string.punctuation
    return ''.join(random.choice(chars) for _ in range(length))

if __name__ == "__main__":
    print(f"Circle Area (r=5): {calculate_circle_area(5)}")
    print(f"Fahrenheit to Celsius (32F): {fahrenheit_to_celsius(32)}")
    print(f"Is 'A man, a plan, a canal: Panama' a palindrome?: {check_palindrome('A man, a plan, a canal: Panama')}")
    print(f"Fibonacci (5): {fibonacci_iterative(5)}")
    print(f"Random Password (len 12): {generate_random_password(12)}")

```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51653' '--' 'c:\Users\shash\rful-crud28\AAC A 9.4.p
Circle Area (r=5): 78.53981633974483
Random Password (len 12): |fs^QAG1Sj7W
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51681' '--' 'c:\Users\shash\rful-crud28\AAC A 9.4.p
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): +'KO*,A{IR}N
PS C:\Users\shash\rful-crud28> 
```

Task 4: Converting Developer Comments into Structured Docstrings

Scenario

In a legacy project, developers have written long explanatory comments inside functions instead of proper docstrings. The team now wants to standardize documentation.

Task Description

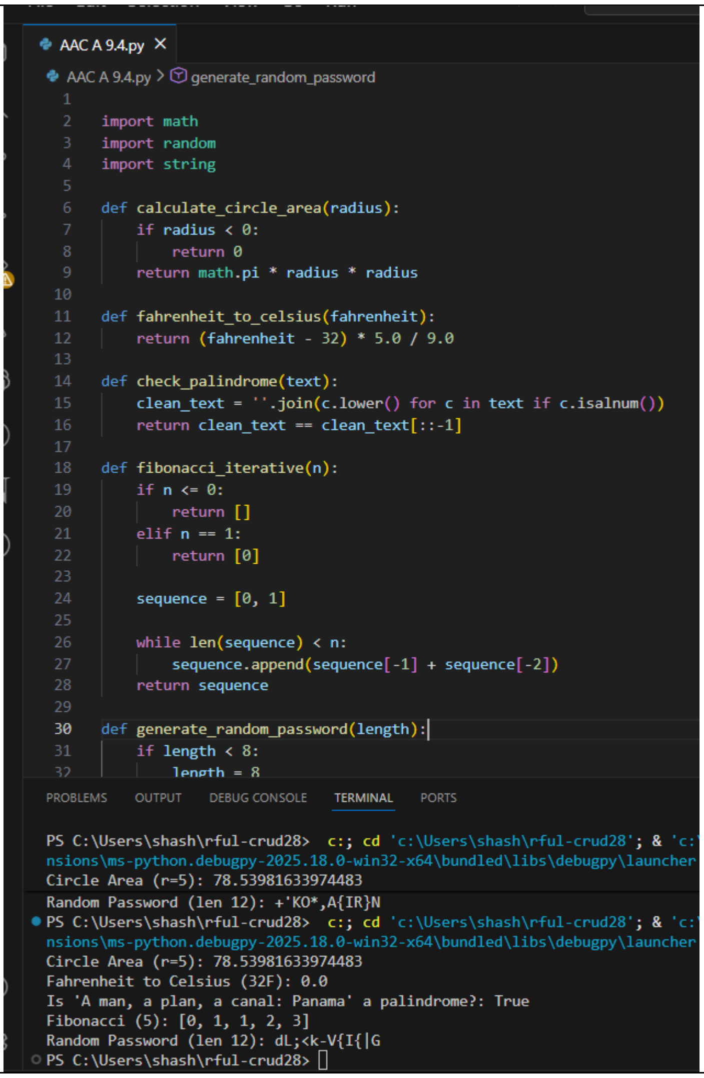
You are given a Python script where functions contain detailed inline comments explaining their logic.
Use AI to:

- Automatically convert these comments into structured **Google-style or NumPy-style docstrings**
- Preserve the original meaning and intent of the comments
- Remove redundant inline comments after conversion

Expected Outcome

- Functions with clean, standardized docstrings
- Reduced clutter inside function bodies

	• Improved consistency across the codebase	

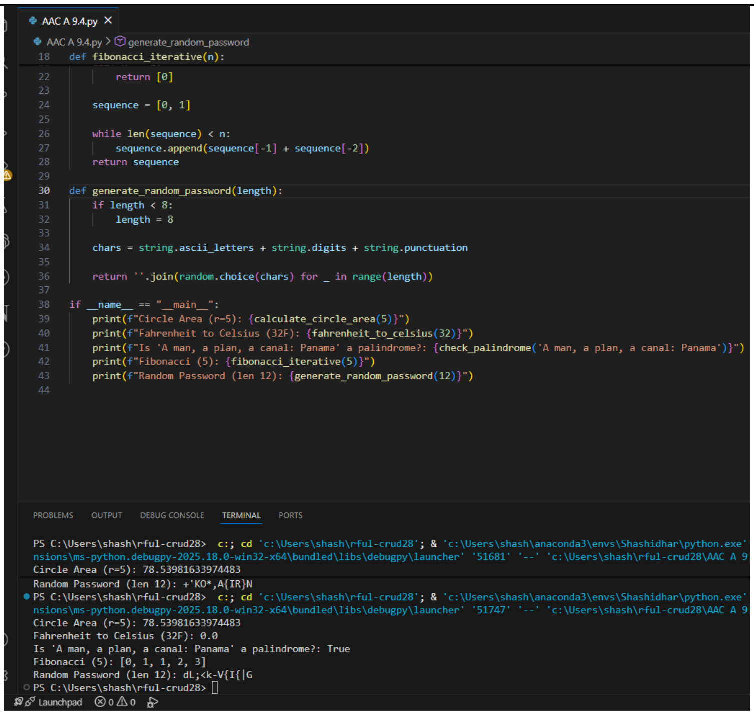
	●			

AAC A 9.4.py

AAC A 9.4.py > generate_random_password

```python

import math
import random
import string

def calculate_circle_area(radius):
    if radius < 0:
        return 0
    return math.pi * radius * radius

def fahrenheit_to_celsius(fahrenheit):
    return (fahrenheit - 32) * 5.0 / 9.0

def check_palindrome(text):
    clean_text = ''.join(c.lower() for c in text if c.isalnum())
    return clean_text == clean_text[::-1]

def fibonacci_iterative(n):
    if n <= 0:
        return []
    elif n == 1:
        return [0]

    sequence = [0, 1]

    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8
```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher
Circle Area (r=5): 78.53981633974483
Random Password (len 12): +'KO*,A{IR}N
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): dL;<k-V{I{|G
PS C:\Users\shash\rful-crud28>
```



```python
def fibonacci_iterative(n):
        return [0]

    sequence = [0, 1]

    while len(sequence) < n:
        sequence.append(sequence[-1] + sequence[-2])
    return sequence

def generate_random_password(length):
    if length < 8:
        length = 8

    chars = string.ascii_letters + string.digits + string.punctuation

    return ''.join(random.choice(chars) for _ in range(length))

if __name__ == "__main__":
    print(f"Circle Area (r=5): {calculate_circle_area(5)}")
    print(f"Fahrenheit to Celsius (32F): {fahrenheit_to_celsius(32)}")
    print(f"Is 'A man, a plan, a canal: Panama' a palindrome?: {check_palindrome('A man, a plan, a canal: Panama')}")
    print(f"Fibonacci (5): {fibonacci_iterative(5)}")
    print(f"Random Password (len 12): {generate_random_password(12)}")
```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe'
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51681' '--' 'c:\Users\shash\rful-crud28\AAC A 9
Circle Area (r=5): 78.53981633974483
Random Password (len 12): +'KO*,A{IR}N
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe'
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51747' '--' 'c:\Users\shash\rful-crud28\AAC A 9
Circle Area (r=5): 78.53981633974483
Fahrenheit to Celsius (32F): 0.0
Is 'A man, a plan, a canal: Panama' a palindrome?: True
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): dL;<k-V{I{|G
PS C:\Users\shash\rful-crud28>
```

Task 5: Building a Mini Automatic Documentation Generator

Scenario

Your team wants a simple internal tool that helps developers start documenting new Python files quickly, without writing documentation from scratch.

Task Description

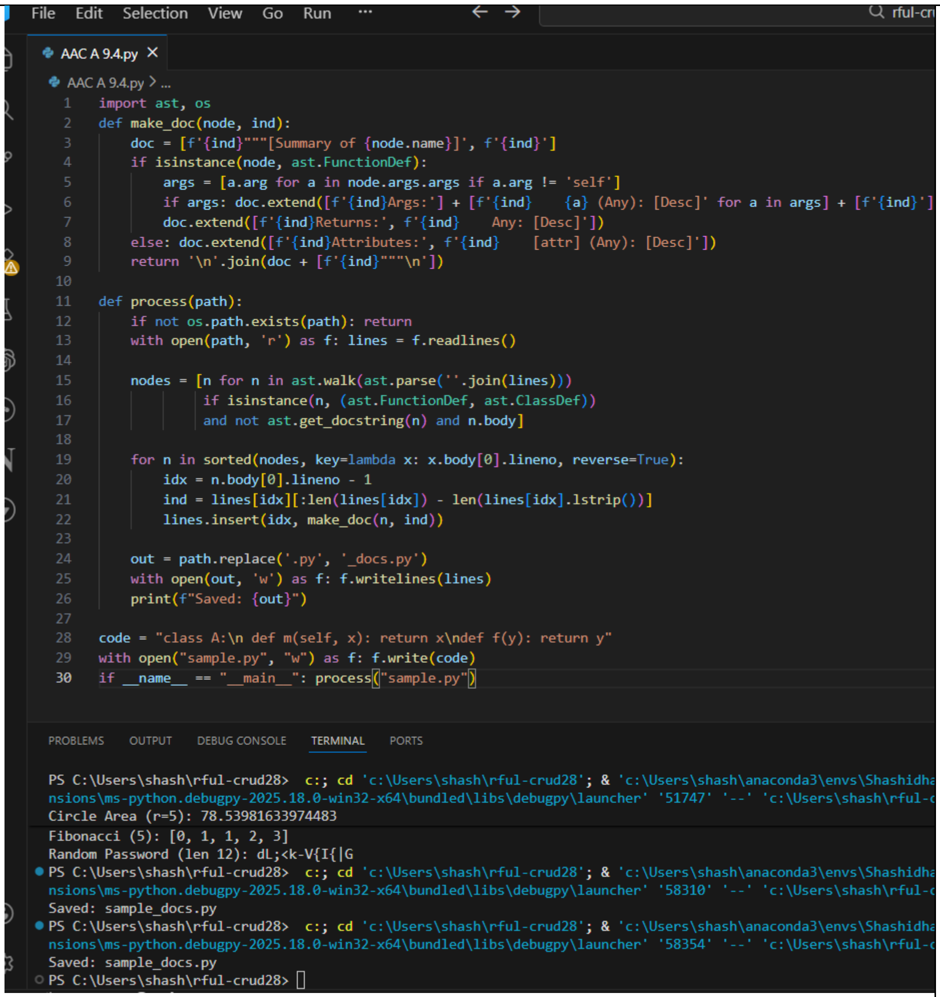
Design a small Python utility that:

- Reads a given `.py` file
- Automatically detects:
  - Functions
  - Classes
- Inserts **placeholder Google-style docstrings** for each detected function or class

AI tools may be used to assist in generating or refining this utility.
Note: The goal is **documentation scaffolding**, not perfect documentation.

Expected Outcome

- A working Python script that processes another `.py` file
- Automatically inserted placeholder docstrings
- Clear demonstration of how AI can assist in documentation automation



```python
import ast, os
def make_doc(node, ind):
    doc = [f'{ind}"""[Summary of {node.name}]', f'{ind}']
    if isinstance(node, ast.FunctionDef):
        args = [a.arg for a in node.args.args if a.arg != 'self']
        if args: doc.extend([f'{ind}Args:'] + [f'{ind}    {a} (Any): [Desc]' for a in args] + [f'{ind}']
        doc.extend([f'{ind}Returns:', f'{ind}    Any: [Desc]'])
    else: doc.extend([f'{ind}Attributes:', f'{ind}    [attr] (Any): [Desc]'])
    return '\n'.join(doc + [f'{ind}"""\n'])

def process(path):
    if not os.path.exists(path): return
    with open(path, 'r') as f: lines = f.readlines()

    nodes = [n for n in ast.walk(ast.parse(''.join(lines)))
             if isinstance(n, (ast.FunctionDef, ast.ClassDef))
             and not ast.get_docstring(n) and n.body]

    for n in sorted(nodes, key=lambda x: x.body[0].lineno, reverse=True):
        idx = n.body[0].lineno - 1
        ind = lines[idx][:len(lines[idx]) - len(lines[idx].lstrip())]
        lines.insert(idx, make_doc(n, ind))

    out = path.replace('.py', '_docs.py')
    with open(out, 'w') as f: f.writelines(lines)
    print(f"Saved: {out}")

code = "class A:\n def m(self, x): return x\ndef f(y): return y"
with open("sample.py", "w") as f: f.write(code)
if __name__ == "__main__": process("sample.py")
```

```
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidha
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '51747' '--' 'c:\Users\shash\rful-c
Circle Area (r=5): 78.53981633974483
Fibonacci (5): [0, 1, 1, 2, 3]
Random Password (len 12): dL;<k-V{I{|G
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidha
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '58310' '--' 'c:\Users\shash\rful-c
Saved: sample_docs.py
PS C:\Users\shash\rful-crud28>  c:; cd 'c:\Users\shash\rful-crud28'; & 'c:\Users\shash\anaconda3\envs\Shashidha
nsions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '58354' '--' 'c:\Users\shash\rful-c
Saved: sample_docs.py
PS C:\Users\shash\rful-crud28> 
```

Note: Report should be submitted a word document for all tasks in a single document with prompts, comments & code explanation, and output and if required, screenshots