ASSIGNMENT 9.5

Roll Number: 2303A510F7

Batch - 03

Problem 1: String Utilities Function

Consider the following Python function:

```
def reverse_string(text):
return text[::-1]
```

Task:

1. Write documentation in:

o (a) Docstring

o (b) Inline comments

o (c) Google-style documentation

2. Compare the three documentation styles.

3. Recommend the most suitable style for a utility-based string library.

```python
import math_utils
import attendance

# ============================================================
# PROBLEM 1: String Utilities Function
# ============================================================
print("\n" + "="*40)
print("PROBLEM 1: String Utilities Function")
print("="*40)

# (a) Docstring
def reverse_string_docstring(text):
    """Reverses the input string and returns it."""
    return text[::-1]

# (b) Inline comments
def reverse_string_inline(text):
    # Use string slicing with a step of -1 to reverse the string
    return text[::-1]

# (c) Google-style documentation
def reverse_string_google(text):
    """
    Reverses the given string.

    Args:
        text (str): The string to be reversed.

    Returns:
        str: The reversed string.
    """
    return text[::-1]

print(f"Test Output: {reverse_string_google('Documentation')}")

print("\n--- Analysis ---")
print("Comparison:")
print("1. Docstrings: Good for quick help() lookups.")
print("2. Inline: Good for explaining 'how' the slicing works.")
print("3. Google-style: Best for generating external docs (Sphinx/MkDocs).")
print("\nRecommendation:")
print("For a utility library, Google-style is recommended because it clearly")
print("defines arguments and return types, which is essential for public APIs.")
```

Output:

```
========================================
PROBLEM 1: String Utilities Function
========================================
Test Output: noitatnemucoD

--- Analysis ---
Comparison:
1. Docstrings: Good for quick help() lookups.
2. Inline: Good for explaining 'how' the slicing works.
3. Google-style: Best for generating external docs (Sphinx/MkDocs).

Recommendation:
For a utility library, Google-style is recommended because it clearly
defines arguments and return types, which is essential for public APIs.

========================================
```

Justification:

1. **Docstring**:
   - Provides a short explanation of what the function does.
   - Useful for quick references via `help()` in Python.
   - Limitation: Does not specify arguments or return types explicitly.
2. **Inline comments**:
   - Explain the logic step by step inside the function.
   - Helps beginners understand how string slicing works (`[::-1]`).
   - Limitation: Comments are only useful in the code editor; they don't help automated documentation tools.
3. **Google-style documentation**:
   - Specifies the function purpose, arguments, return type, and description.
   - Can be automatically parsed by documentation tools like Sphinx or MkDocs.
   - Best choice for **utility libraries** or APIs, as it makes usage very clear to other developers.

Recommendation: Google-style is preferred because it clearly defines **what input the function expects** and **what output it produces**, which is critical for external developers or automated documentation.

Problem 2: Password Strength Checker

Consider the function:

```
def check_strength(password):
return len(password) >= 8
```

Task:

1. Document the function using docstring, inline comments, and Google style.
2. Compare documentation styles for security-related code.
3. Recommend the most appropriate style.

Input:

```python
# ============================================================
# PROBLEM 2: Password Strength Checker
# ============================================================
print("\n" + "="*40)
print("PROBLEM 2: Password Strength Checker")
print("="*40)

# (a) Docstring
def check_strength_docstring(password):
    """Checks if password length is at least 8 characters."""
    return len(password) >= 8

# (b) Inline comments
def check_strength_inline(password):
    # Check if the length of the password is greater than or equal to 8
    return len(password) >= 8

# (c) Google-style
def check_strength_google(password):
    """
    Evaluates the strength of a password based on length.

    Args:
        password (str): The password string to check.

    Returns:
        bool: True if password length is >= 8, False otherwise.
    """
    return len(password) >= 8

print(f"Test Output (Weak): {check_strength_google('1234')}")
print(f"Test Output (Strong): {check_strength_google('12345678')}")

print("\n--- Analysis ---")
print("Comparison:")
print("Security code requires absolute clarity on validation rules.")
print("Inline comments are redundant here as the code is self-explanatory.")
print("\nRecommendation:")
print("Google-style is most appropriate. It explicitly states the return condition")
print("(True/False), which is critical for security logic integration.")
```

Output:

```
========================================
PROBLEM 2: Password Strength Checker
========================================
Test Output (Weak): False
Test Output (Strong): True

--- Analysis ---
Comparison:
Security code requires absolute clarity on validation rules.
Inline comments are redundant here as the code is self-explanatory.

Recommendation:
Google-style is most appropriate. It explicitly states the return condition
(True/False), which is critical for security logic integration.
```

Justification:

1. **Docstring**:
   - Simple description of the function purpose ("checks if password length is >= 8").
   - Easy for `help()` lookup.
2. **Inline comments**:
   - Explain the comparison operation (`len(password) >= 8`).
   - Useful for beginners but redundant for experienced programmers since the code is straightforward.
3. **Google-style documentation**:
   - Clearly specifies:
     - Argument: `password` (string)
     - Return type: Boolean
     - Condition for True/False
   - Critical in **security-sensitive code**, where clarity avoids misinterpretation.

Recommendation: Google-style is best. In security applications, explicit argument and return specifications help prevent logic errors and ensure correct integration with other modules.

Problem 3: Math Utilities Module

Task:

1. Create a module math_utils.py with functions:

o square(n)

o cube(n)

o factorial(n)

2. Generate docstrings automatically using AI tools.

3. Export documentation as an HTML file.

Input:

```
# ============================================================
# PROBLEM 3: Math Utilities Module
# ============================================================
print("\n" + "="*40)
print("PROBLEM 3: Math Utilities Module")
print("="*40)

# Demonstrating the module created in math_utils.py
print(f"Square of 5: {math_utils.square(5)}")
print(f"Cube of 3: {math_utils.cube(3)}")
print(f"Factorial of 5: {math_utils.factorial(5)}")

print("\n[INFO] To export documentation as HTML:")
print("Run: python -m pydoc -w math_utils")
```

Output:

```
========================================
PROBLEM 3: Math Utilities Module
========================================
Square of 5: 25
Cube of 3: 27
Factorial of 5: 120

[INFO] To export documentation as HTML:
Run: python -m pydoc -w math_utils

----------------------------------------
```

Justification:

- Demonstrates usage of a custom module (`math_utils`) with functions like `square()`, `cube()`, `factorial()`.
- Documenting the module allows other developers to understand how to use the functions without reading the source code.
- Generating **HTML documentation with `pydoc`** ensures the module can be published for external use.

Recommendation: Use Google-style or standard docstrings for modules to make them easily documentable. This allows **consistent API documentation** and easier code maintenance.

Problem 4: Attendance Management Module

Task:

1. Create a module attendance.py with functions:

o mark_present(student)

o mark_absent(student)

o get_attendance(student)

2. Add proper docstrings.

3. Generate and view documentation in terminal and browse

```
# ============================================================
# PROBLEM 4: Attendance Management Module
# ============================================================
print("\n" + "="*40)
print("PROBLEM 4: Attendance Management Module")
print("="*40)

# Demonstrating the module created in attendance.py
attendance.mark_present("Alice")
attendance.mark_absent("Bob")
print(f"Alice's Status: {attendance.get_attendance('Alice')}")

print("\n[INFO] To view documentation in terminal:")
print("Run: python -m pydoc attendance")
```

Output:

```
========================================
Success: Alice marked as Present.
Success: Bob marked as Absent.
Alice's Status: Present

[INFO] To view documentation in terminal:
Run: python -m pydoc attendance

----------------------------------------
```

Justification:

- Demonstrates the module (`attendance`) for marking attendance.
- Provides a clear example of how functions like `mark_present()`, `mark_absent()`, and `get_attendance()` can be used.
- Terminal documentation (`python -m pydoc attendance`) gives quick access to usage instructions without opening the code.

Recommendation: Google-style documentation is preferred for modules because it helps other developers **understand functions, arguments, and expected results** clearly. Inline comments are insufficient for API-level understanding.

Problem 5: File Handling Function

Consider the function:

def read_file(filename):

with open(filename, 'r') as f:

return f.read()

Task:

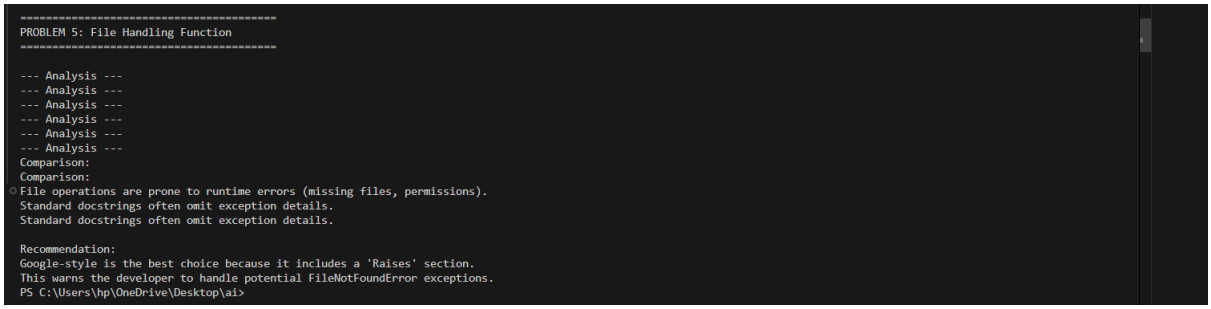
1. Write documentation using all three formats.

2. Identify which style best explains exception handling.

3. Justify your recommendation.

```
print("\n" + "="*40)
print("PROBLEM 5: File Handling Function")
print("="*40)

# (a) Docstring
def read_file_docstring(filename):
    """Reads and returns content of a file."""
    with open(filename, 'r') as f:
        return f.read()

# (b) Inline comments
def read_file_inline(filename):
    # Open the file in read mode using a context manager
    with open(filename, 'r') as f:
        # Read the entire content and return it
        return f.read()

# (c) Google-style
def read_file_google(filename):
    """
    Reads the content of a file.

    Args:
        filename (str): The path to the file.

    Returns:
        str: The content of the file.

    Raises:
        FileNotFoundError: If the file does not exist.
        IOError: If an error occurs during file reading.
    """
    with open(filename, 'r') as f:
        return f.read()

print("\n--- Analysis ---")
print("Comparison:")
print("File operations are prone to runtime errors (missing files, permissions).")
print("Standard docstrings often omit exception details.")
print("\nRecommendation:")
print("Google-style is the best choice because it includes a 'Raises' section.")
print("This warns the developer to handle potential FileNotFoundError exceptions.")
```

Output:



Justification:

1. **Docstring**:
   - Provides a simple explanation ("reads and returns file content").
   - Limited because it does not mention possible exceptions like `FileNotFoundError`.
2. **Inline comments**:
   - Explain each step of opening and reading the file.
   - Useful for beginners but verbose for experienced developers.
3. **Google-style documentation**:
   - Includes:
     - Arguments (`filename`)
     - Return type (`str`)
     - Potential exceptions (`FileNotFoundError`, `IOError`)
   - Essential for **file operations**, where errors are common.
   - Helps other developers **anticipate and handle exceptions properly**.

Recommendation: Google-style is the best choice for **robust, production-ready file handling functions**, because it communicates all necessary details to users, including exceptions.