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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 4 - Thursday	**Time(s)**	23CSBTB01 To 23CSBTB52
Duration	2 Hours	**Applicable to Batches**	All Batches
AssignmentNumber: **8.4** (Present assignment number)/**24**(Total number of assignments)			

Q.No.	Question	*ExpectedTime to complete*
1	Lab 8: Test-Driven Development with AI – Generating and Working with Test Cases	Week 4

Lab Objectives:

- To introduce students to test-driven development (TDD) using AI code generation tools.
- To enable the generation of test cases before writing code implementations.
- To reinforce the importance of testing, validation, and error handling.
- To encourage writing clean and reliable code based on AI-generated test expectations.

Lab Outcomes (LOs):

By the end of this lab, students will be able to:

- Apply TDD methodology using AI tools.
- Generate test cases before writing the actual code logic.
- Validate and refactor code based on test outcomes.
- Use Python's unittest or pytest libraries for test-driven development.
- Develop confidence in debugging and improving code with AI guidance.

Task 1: Developing a Utility Function Using TDD

Scenario

You are working on a small utility library for a larger software system. One of the required functions should calculate the square of a given number, and correctness is critical because other modules depend on it.

Task Description

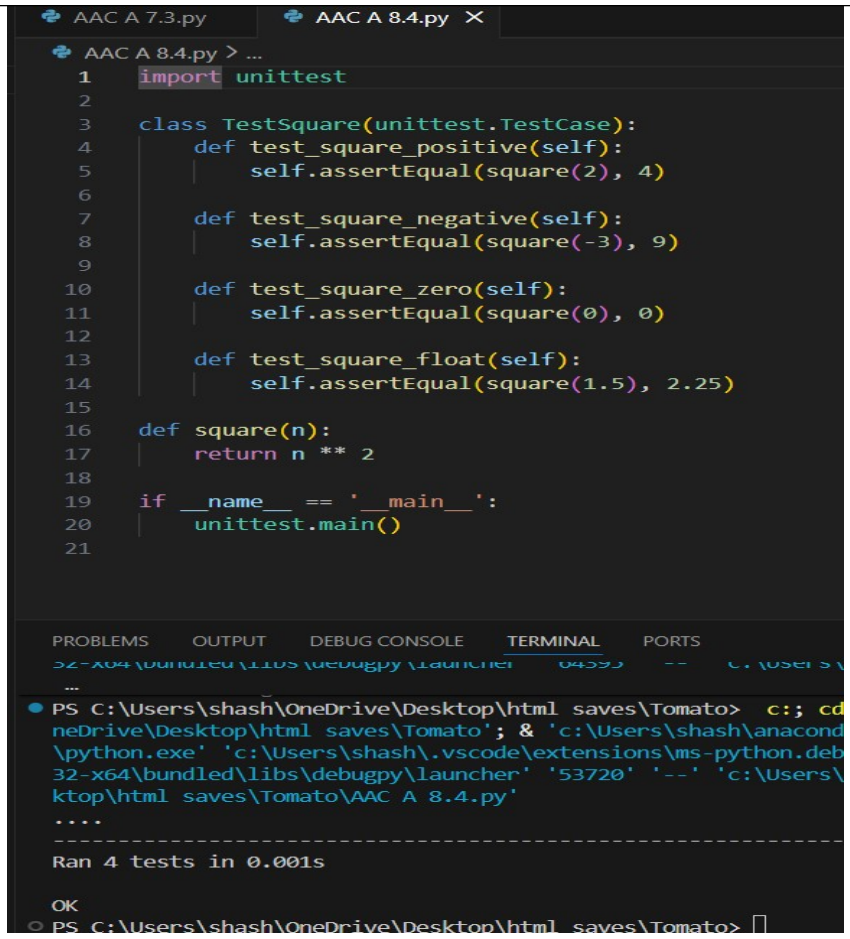
Following the **Test Driven Development (TDD)** approach:

1. First, write unit test cases to verify that a function correctly returns the square of a number for multiple inputs.
2. After defining the test cases, use **GitHub Copilot or Cursor AI** to generate the function implementation so that all tests pass.

Ensure that the function is written **only after** the tests are created.

Expected Outcome

- A separate test file and implementation file
- Clearly written test cases executed before implementation
- AI-assisted function implementation that passes all tests
- Demonstration of the TDD cycle: *test → fail → implement → pass*

- 

Task 2: Email Validation for a User Registration System

Scenario
You are developing the backend of a user registration system. One requirement is to validate user email addresses before storing them in the database.

Task Description
Apply **Test Driven Development** by:

1. Writing unit test cases that define valid and invalid email formats (e.g., missing @, missing domain, incorrect structure).
2. Using **AI assistance** to implement the validate_email() function based strictly on the behavior described by the test cases.

The implementation should be driven entirely by the test expectations.

Expected Outcome

- Well-defined unit tests using unittest or pytest
- An AI-generated email validation function
- All test cases passing successfully
- Clear alignment between test cases and function behavior

AAC A 7.3.py | AAC A 8.4.py

AAC A 8.4.py > ...

```python
import unittest
import re

class TestEmailValidation(unittest.TestCase):
    def test_valid_email(self):
        self.assertTrue(validate_email("user@example.com"))

    def test_email_without_at(self):
        self.assertFalse(validate_email("userexample.com"))

    def test_email_without_domain(self):
        self.assertFalse(validate_email("user@"))

    def test_email_with_invalid_chars(self):
        self.assertFalse(validate_email("user@exam ple.com"))

    def test_email_with_multiple_at(self):
        self.assertFalse(validate_email("user@@example.com"))

def validate_email(email):
    pattern = r'^[a-zA-Z0-9._%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}$'
    return re.match(pattern, email) is not None
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato>  c:; cd 'c:\Users\shash
neDrive\Desktop\html saves\Tomato'; & 'c:\Users\shash\anaconda3\envs\Shashidh
\python.exe' 'c:\Users\shash\.vscode\extensions\ms-python.debugpy-2025.18.0-w
32-x64\bundled\libs\debugpy\launcher' '54475' '--' 'c:\Users\shash\OneDrive\D
ktop\html saves\Tomato\AAC A 8.4.py'
.....
----------------------------------------------------------------------
Ran 5 tests in 0.001s

OK
```

Task 3: Decision Logic Development Using TDD

Scenario
In a grading or evaluation module, a function is required to determine the maximum value among three inputs. Accuracy is essential, as incorrect results could affect downstream decision logic.

Task Description
Using the **TDD methodology**:

1. Write test cases that describe the expected output for different combinations of three numbers.
2. Prompt **GitHub Copilot or Cursor AI** to implement the function logic based on the written tests.

Avoid writing any logic before test cases are completed.

Expected Outcome

- Comprehensive test cases covering normal and edge cases
- AI-generated function implementation
- Passing test results demonstrating correctness
- Evidence that logic was derived from tests, not assumptions

AAC A 7.3.py | AAC A 8.4.py

AAC A 8.4.py > TestMaxOfThree > test_max_first_max

```python
import unittest

class TestMaxOfThree(unittest.TestCase):
    def test_max_all_positive(self):
        self.assertEqual(max_of_three(1, 2, 3), 3)

    def test_max_with_negatives(self):
        self.assertEqual(max_of_three(-1, -2, -3), -1)

    def test_max_mixed(self):
        self.assertEqual(max_of_three(-1, 5, 0), 5)

    def test_max_duplicates(self):
        self.assertEqual(max_of_three(2, 2, 2), 2)

    def test_max_first_max(self):
        self.assertEqual(max_of_three(10, 5, 7), 10)

def max_of_three(a, b, c):
    return max(a, b, c)

if __name__ == '__main__':
    unittest.main()
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato> python "AAC A 8.4.py"
----------------------------------------------------------------------
Ran 5 tests in 0.001s

OK
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato> python "AAC A 8.4.py"
.....
----------------------------------------------------------------------
Ran 5 tests in 0.000s

OK
```

-

Task 4: Shopping Cart Development with AI-Assisted TDD

Scenario
You are building a simple shopping cart module for an e-commerce application. The cart must support adding items, removing items, and calculating the total price accurately.

Task Description
Follow a **test-driven approach**:

1. Write unit tests for each required behavior:
    - Adding an item
    - Removing an item
    - Calculating the total price
2. After defining all tests, use **AI tools** to generate the ShoppingCart class and its methods so that the tests pass.

Focus on behavior-driven testing rather than implementation details.

Expected Outcome

- Unit tests defining expected shopping cart behavior
- AI-generated class implementation
- All tests passing successfully
- Clear demonstration of TDD applied to a class-based design

AAC A 7.3.py | AAC A 8.4.py

AAC A 8.4.py > TestShoppingCart > test_calculate_total_empty

```python
import unittest

class TestShoppingCart(unittest.TestCase):
    def setUp(self):
        self.cart = ShoppingCart()

    def test_add_item(self):
        self.cart.add_item(("apple", 1.0))
        self.assertEqual(len(self.cart.items), 1)
        self.assertEqual(self.cart.items[0], ("apple", 1.0))

    def test_remove_item(self):
        self.cart.add_item(("apple", 1.0))
        self.cart.remove_item(("apple", 1.0))
        self.assertEqual(len(self.cart.items), 0)

    def test_calculate_total_empty(self):
        self.assertEqual(self.cart.calculate_total(), 0.0)

    def test_calculate_total_with_items(self):
        self.cart.add_item(("apple", 1.0))
        self.cart.add_item(("banana", 0.5))
        self.assertEqual(self.cart.calculate_total(), 1.5)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato> python "AAC A 8.4.py"
----------------------------------------------------------------------
Ran 5 tests in 0.000s

OK
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato> python "AAC A 8.4.py"
....
----------------------------------------------------------------------
Ran 4 tests in 0.000s

OK
PS C:\Users\shash\OneDrive\Desktop\html saves\Tomato>
```

Task 5: String Validation Module Using TDD

Scenario
You are working on a text-processing module where a function is required to identify whether a given string is a palindrome. The function must handle different cases and inputs reliably.

Task Description
Using **Test Driven Development**:

1. Write test cases for a palindrome checker covering:
    - Simple palindromes
    - Non-palindromes
    - Case variations
2. Use **GitHub Copilot or Cursor AI** to generate the is_palindrome() function based on the test case expectations.

The function should be implemented only after tests are written.

Expected Outcome

- Clearly written test cases defining expected behavior

- AI-assisted implementation of the palindrome checker
- All test cases passing successfully
- Evidence of TDD methodology applied correctly

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