NAME:M.AKASH H.NO: 2303A51820 BATCH:26

ASSIGNMENT-3.3

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

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

Assignment Number: **3.3**(Present assignment number)/**24**(Total number of assignments)

Q.No.	**Question**	***Expected Time to complete***
1	**Lab 3: Application for TGNPDCL – Electricity Bill Generation Using Python & AI Tools** **Lab Objectives** • To design a real-world electricity billing application using Python • To use AI-assisted coding tools for logic generation and optimization • To understand conditional logic and arithmetic operations • To generate structured billing output similar to utility bills **Lab Outcomes (LOs)** After completing this lab, students will be able to:	Week2 - Wednesday

- Read and validate user input in Python
- Apply conditional logic for tariff-based billing
- Use AI tools to assist in program development
- Calculate and display electricity bill components
- Build a complete real-time application

Task 1: AI-Generated Logic for Reading Consumer Details

Scenario

An electricity billing system must collect accurate consumer data.

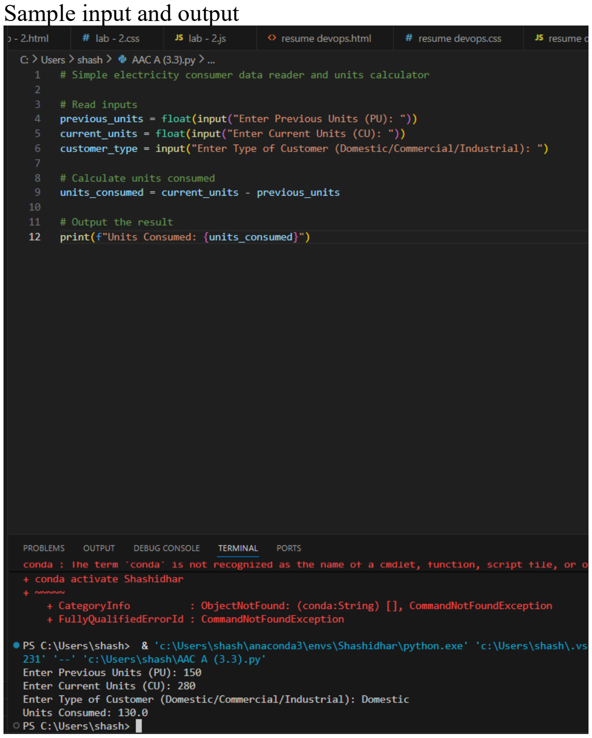
Task Description

Use an AI tool (GitHub Copilot / Gemini) to generate a Python program that:

- Reads:
    - Previous Units (PU)
    - Current Units (CU)
    - Type of Customer
- Calculates units consumed
- Implements logic directly in the main program (no functions)

Expected Output

- Correct input reading
- Units consumed calculation
- Screenshot showing AI-generated code
- Sample input and output



```python
# Simple electricity consumer data reader and units calculator

# Read inputs
previous_units = float(input("Enter Previous Units (PU): "))
current_units = float(input("Enter Current Units (CU): "))
customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ")

# Calculate units consumed
units_consumed = current_units - previous_units

# Output the result
print(f"Units Consumed: {units_consumed}")
```

```
conda : The term 'conda' is not recognized as the name of a cmdlet, function, script file, or o
+ conda activate Shashidhar
+ ~~~~~
    + CategoryInfo          : ObjectNotFound: (conda:String) [], CommandNotFoundException
    + FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\shash>  & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\.vs
231' '--' 'c:\Users\shash\AAC A (3.3).py'
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
PS C:\Users\shash>
```

Task 2: Energy Charges Calculation Based on Units Consumed

Scenario

Energy charges depend on the number of units consumed and customer type.

Task Description

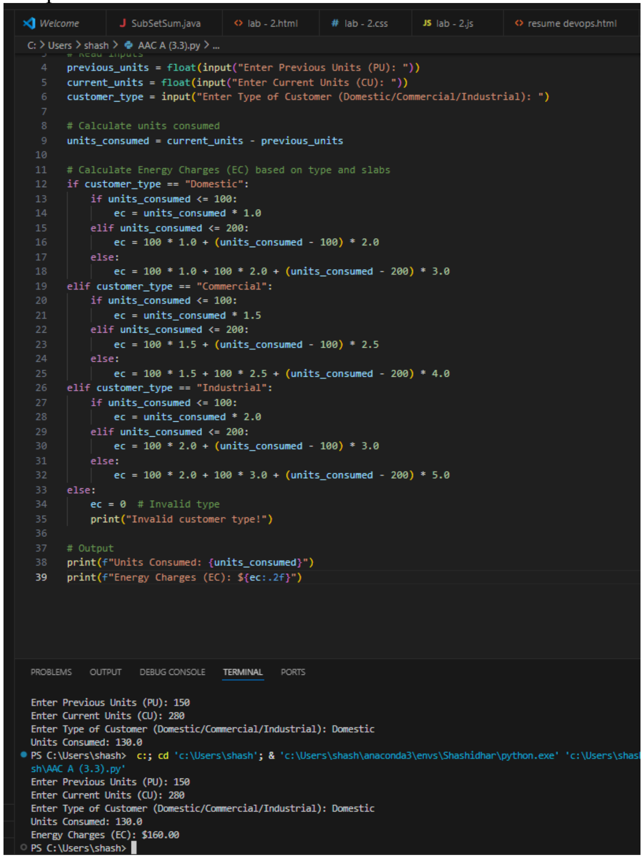
Review the AI-generated code from Task 1 and extend it to:

- Calculate **Energy Charges (EC)**
- Use conditional statements based on:
    - Domestic
    - Commercial
    - Industrial consumers
- Improve readability using AI prompts such as:

- *“Simplify energy charge calculation logic”*
- *“Optimize conditional statements”*

Expected Output

- Correct EC calculation
- Clear conditional logic
- Original and improved versions (optional)
- Sample execution results
-



```python
# Read inputs
previous_units = float(input("Enter Previous Units (PU): "))
current_units = float(input("Enter Current Units (CU): "))
customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ")

# Calculate units consumed
units_consumed = current_units - previous_units

# Calculate Energy Charges (EC) based on type and slabs
if customer_type == "Domestic":
    if units_consumed <= 100:
        ec = units_consumed * 1.0
    elif units_consumed <= 200:
        ec = 100 * 1.0 + (units_consumed - 100) * 2.0
    else:
        ec = 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
elif customer_type == "Commercial":
    if units_consumed <= 100:
        ec = units_consumed * 1.5
    elif units_consumed <= 200:
        ec = 100 * 1.5 + (units_consumed - 100) * 2.5
    else:
        ec = 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
elif customer_type == "Industrial":
    if units_consumed <= 100:
        ec = units_consumed * 2.0
    elif units_consumed <= 200:
        ec = 100 * 2.0 + (units_consumed - 100) * 3.0
    else:
        ec = 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
else:
    ec = 0  # Invalid type
    print("Invalid customer type!")

# Output
print(f"Units Consumed: {units_consumed}")
print(f"Energy Charges (EC): ${ec:.2f}")
```

```
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shas
sh\AAC A (3.3).py'
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
PS C:\Users\shash> 
```

Task 3: Modular Design Using AI Assistance (Using Functions)

Scenario

Billing logic must be reusable for multiple consumers.

Task Description

Use AI assistance to generate a Python program that:

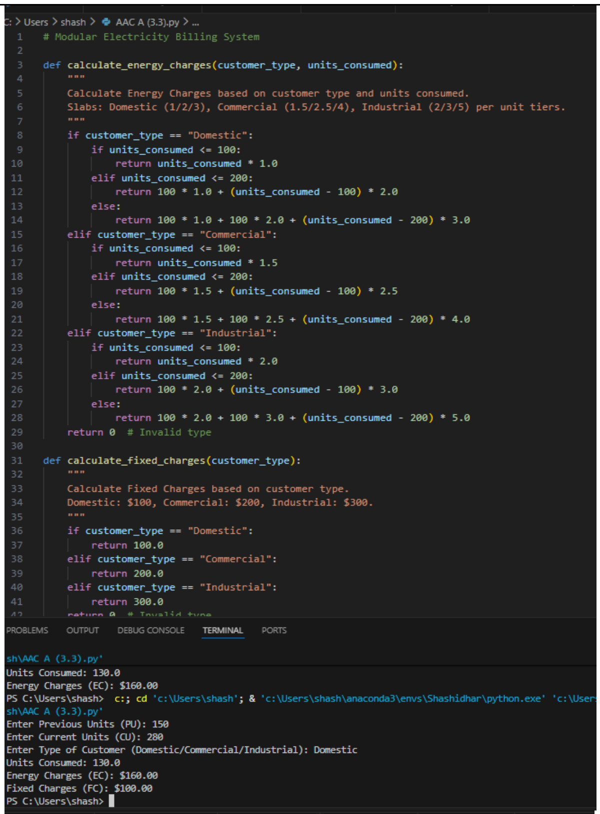
- Uses user-defined functions to:
  - Calculate Energy Charges
  - Calculate Fixed Charges
- Returns calculated values
- Includes meaningful comments

Expected Output

- Function-based Python program
- Correct EC and FC values
- Screenshots of AI-assisted function generation
- Test cases with outputs

NAME:M.AKASH H.NO: 2303A51820 BATCH:26

ASSIGNMENT-3.3

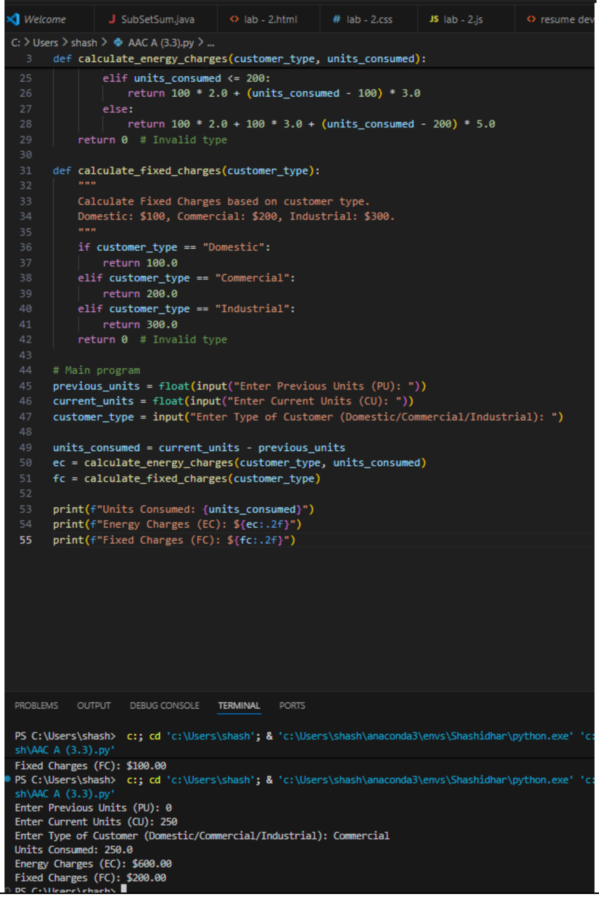


C: > Users > shash > AAC A (3.3).py > ...

```python
# Modular Electricity Billing System

def calculate_energy_charges(customer_type, units_consumed):
    """
    Calculate Energy Charges based on customer type and units consumed.
    Slabs: Domestic (1/2/3), Commercial (1.5/2.5/4), Industrial (2/3/5) per unit tiers.
    """
    if customer_type == "Domestic":
        if units_consumed <= 100:
            return units_consumed * 1.0
        elif units_consumed <= 200:
            return 100 * 1.0 + (units_consumed - 100) * 2.0
        else:
            return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
    elif customer_type == "Commercial":
        if units_consumed <= 100:
            return units_consumed * 1.5
        elif units_consumed <= 200:
            return 100 * 1.5 + (units_consumed - 100) * 2.5
        else:
            return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
    elif customer_type == "Industrial":
        if units_consumed <= 100:
            return units_consumed * 2.0
        elif units_consumed <= 200:
            return 100 * 2.0 + (units_consumed - 100) * 3.0
        else:
            return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
    return 0  # Invalid type

def calculate_fixed_charges(customer_type):
    """
    Calculate Fixed Charges based on customer type.
    Domestic: $100, Commercial: $200, Industrial: $300.
    """
    if customer_type == "Domestic":
        return 100.0
    elif customer_type == "Commercial":
        return 200.0
    elif customer_type == "Industrial":
        return 300.0
    return 0  # Invalid type
```

```
sh\AAC A (3.3).py'
Units Consumed: 130.0
Energy Charges (EC): $160.00
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users
sh\AAC A (3.3).py'
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
Fixed Charges (FC): $100.00
PS C:\Users\shash>
```

•



C: > Users > shash > AAC A (3.3).py > ...

```python
def calculate_energy_charges(customer_type, units_consumed):
        elif units_consumed <= 200:
            return 100 * 2.0 + (units_consumed - 100) * 3.0
        else:
            return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
    return 0  # Invalid type

def calculate_fixed_charges(customer_type):
    """
    Calculate Fixed Charges based on customer type.
    Domestic: $100, Commercial: $200, Industrial: $300.
    """
    if customer_type == "Domestic":
        return 100.0
    elif customer_type == "Commercial":
        return 200.0
    elif customer_type == "Industrial":
        return 300.0
    return 0  # Invalid type

# Main program
previous_units = float(input("Enter Previous Units (PU): "))
current_units = float(input("Enter Current Units (CU): "))
customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ")

units_consumed = current_units - previous_units
ec = calculate_energy_charges(customer_type, units_consumed)
fc = calculate_fixed_charges(customer_type)

print(f"Units Consumed: {units_consumed}")
print(f"Energy Charges (EC): ${ec:.2f}")
print(f"Fixed Charges (FC): ${fc:.2f}")
```

```
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:
sh\AAC A (3.3).py'
Fixed Charges (FC): $100.00
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:
sh\AAC A (3.3).py'
Enter Previous Units (PU): 0
Enter Current Units (CU): 250
Enter Type of Customer (Domestic/Commercial/Industrial): Commercial
Units Consumed: 250.0
Energy Charges (EC): $600.00
Fixed Charges (FC): $200.00
PS C:\Users\shash>
```

NAME:M.AKASH H.NO: 2303A51820 BATCH:26

ASSIGNMENT-3.3

Task 4: Calculation of Additional Charges

Scenario

Electricity bills include multiple additional charges.

Task Description

Extend the program to calculate:

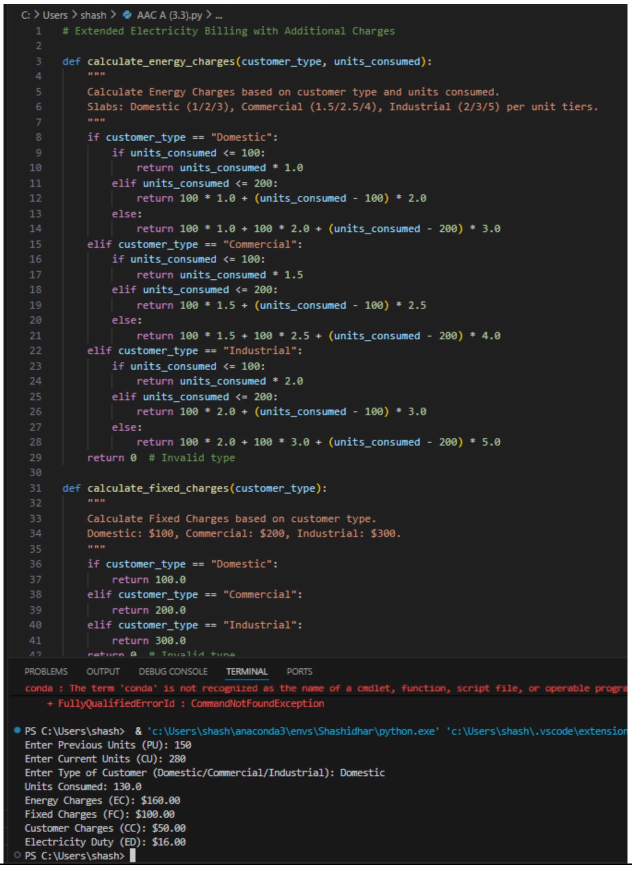
- **FC –** Fixed Charges
- **CC –** Customer Charges
- **ED –** Electricity Duty (percentage of EC)

Use AI prompts like:

- *"Add electricity duty calculation"*
- *"Improve billing accuracy"*

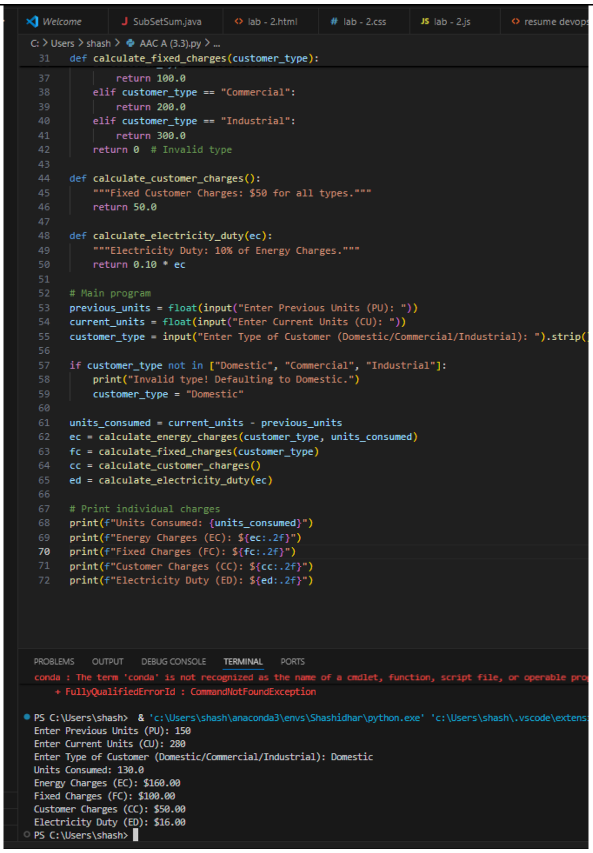
Expected Output

- Individual charge values printed
- Correct duty calculation
- Well-structured output
- Verified intermediate results



```python
# Extended Electricity Billing with Additional Charges

def calculate_energy_charges(customer_type, units_consumed):
    """
    Calculate Energy Charges based on customer type and units consumed.
    Slabs: Domestic (1/2/3), Commercial (1.5/2.5/4), Industrial (2/3/5) per unit tiers.
    """
    if customer_type == "Domestic":
        if units_consumed <= 100:
            return units_consumed * 1.0
        elif units_consumed <= 200:
            return 100 * 1.0 + (units_consumed - 100) * 2.0
        else:
            return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
    elif customer_type == "Commercial":
        if units_consumed <= 100:
            return units_consumed * 1.5
        elif units_consumed <= 200:
            return 100 * 1.5 + (units_consumed - 100) * 2.5
        else:
            return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
    elif customer_type == "Industrial":
        if units_consumed <= 100:
            return units_consumed * 2.0
        elif units_consumed <= 200:
            return 100 * 2.0 + (units_consumed - 100) * 3.0
        else:
            return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
    return 0  # Invalid type

def calculate_fixed_charges(customer_type):
    """
    Calculate Fixed Charges based on customer type.
    Domestic: $100, Commercial: $200, Industrial: $300.
    """
    if customer_type == "Domestic":
        return 100.0
    elif customer_type == "Commercial":
        return 200.0
    elif customer_type == "Industrial":
        return 300.0
    return 0  # Invalid type
```

```
conda : The term 'conda' is not recognized as the name of a cmdlet, function, script file, or operable progra
    + FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\shash>  & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\.vscode\extension
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
Fixed Charges (FC): $100.00
Customer Charges (CC): $50.00
Electricity Duty (ED): $16.00
PS C:\Users\shash> 
```



```python
def calculate_fixed_charges(customer_type):
        return 100.0
    elif customer_type == "Commercial":
        return 200.0
    elif customer_type == "Industrial":
        return 300.0
    return 0  # Invalid type

def calculate_customer_charges():
    """Fixed Customer Charges: $50 for all types."""
    return 50.0

def calculate_electricity_duty(ec):
    """Electricity Duty: 10% of Energy Charges."""
    return 0.10 * ec

# Main program
previous_units = float(input("Enter Previous Units (PU): "))
current_units = float(input("Enter Current Units (CU): "))
customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ").strip(

if customer_type not in ["Domestic", "Commercial", "Industrial"]:
    print("Invalid type! Defaulting to Domestic.")
    customer_type = "Domestic"

units_consumed = current_units - previous_units
ec = calculate_energy_charges(customer_type, units_consumed)
fc = calculate_fixed_charges(customer_type)
cc = calculate_customer_charges()
ed = calculate_electricity_duty(ec)

# Print individual charges
print(f"Units Consumed: {units_consumed}")
print(f"Energy Charges (EC): ${ec:.2f}")
print(f"Fixed Charges (FC): ${fc:.2f}")
print(f"Customer Charges (CC): ${cc:.2f}")
print(f"Electricity Duty (ED): ${ed:.2f}")
```

```
conda : The term 'conda' is not recognized as the name of a cmdlet, function, script file, or operable pro
    + FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\shash>  & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\.vscode\extens
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
Fixed Charges (FC): $100.00
Customer Charges (CC): $50.00
Electricity Duty (ED): $16.00
PS C:\Users\shash> 
```

Task 5: Final Bill Generation and Output Analysis

Scenario

The final electricity bill must present all values clearly.

Task Description

Develop the final Python application to:

- Calculate total bill:
- Total Bill = EC + FC + CC + ED
- Display:
  - Energy Charges (EC)
  - Fixed Charges (FC)
  - Customer Charges (CC)
  - Electricity Duty (ED)
  - Total Bill Amount
- Analyze the program based on:
  - Accuracy
  - Readability
  - Real-world applicability

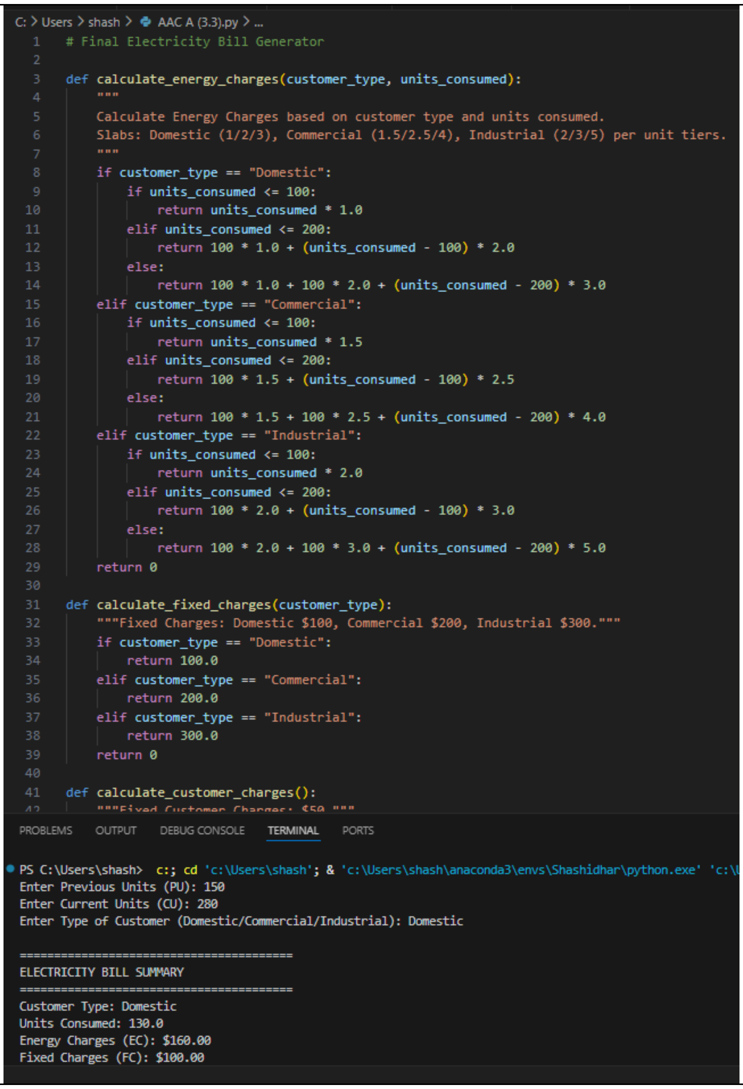
Expected Output

- Complete electricity bill output
- Neatly formatted display
- Sample input/output
- Short analysis paragraph

NAME:M.AKASH H.NO: 2303A51820 BATCH:26

ASSIGNMENT-3.3

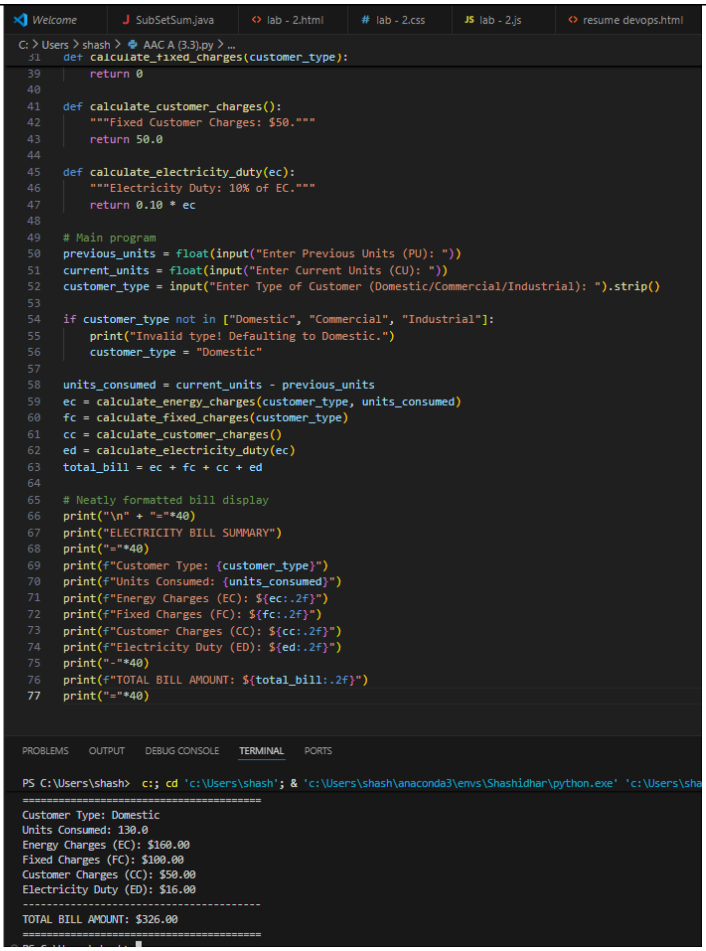
<table>
<tr><td></td><td>•</td><td>



```python
# Final Electricity Bill Generator

def calculate_energy_charges(customer_type, units_consumed):
    """
    Calculate Energy Charges based on customer type and units consumed.
    Slabs: Domestic (1/2/3), Commercial (1.5/2.5/4), Industrial (2/3/5) per unit tiers.
    """
    if customer_type == "Domestic":
        if units_consumed <= 100:
            return units_consumed * 1.0
        elif units_consumed <= 200:
            return 100 * 1.0 + (units_consumed - 100) * 2.0
        else:
            return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
    elif customer_type == "Commercial":
        if units_consumed <= 100:
            return units_consumed * 1.5
        elif units_consumed <= 200:
            return 100 * 1.5 + (units_consumed - 100) * 2.5
        else:
            return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
    elif customer_type == "Industrial":
        if units_consumed <= 100:
            return units_consumed * 2.0
        elif units_consumed <= 200:
            return 100 * 2.0 + (units_consumed - 100) * 3.0
        else:
            return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
    return 0

def calculate_fixed_charges(customer_type):
    """Fixed Charges: Domestic $100, Commercial $200, Industrial $300."""
    if customer_type == "Domestic":
        return 100.0
    elif customer_type == "Commercial":
        return 200.0
    elif customer_type == "Industrial":
        return 300.0
    return 0

def calculate_customer_charges():
    """Fixed Customer Charges: $50."""
```

```
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\
Enter Previous Units (PU): 150
Enter Current Units (CU): 280
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic

========================================
ELECTRICITY BILL SUMMARY
========================================
Customer Type: Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
Fixed Charges (FC): $100.00
```

</td><td></td><td></td></tr>
</table>



```python
def calculate_fixed_charges(customer_type):
        return 0

def calculate_customer_charges():
    """Fixed Customer Charges: $50."""
    return 50.0

def calculate_electricity_duty(ec):
    """Electricity Duty: 10% of EC."""
    return 0.10 * ec

# Main program
previous_units = float(input("Enter Previous Units (PU): "))
current_units = float(input("Enter Current Units (CU): "))
customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ").strip()

if customer_type not in ["Domestic", "Commercial", "Industrial"]:
    print("Invalid type! Defaulting to Domestic.")
    customer_type = "Domestic"

units_consumed = current_units - previous_units
ec = calculate_energy_charges(customer_type, units_consumed)
fc = calculate_fixed_charges(customer_type)
cc = calculate_customer_charges()
ed = calculate_electricity_duty(ec)
total_bill = ec + fc + cc + ed

# Neatly formatted bill display
print("\n" + "="*40)
print("ELECTRICITY BILL SUMMARY")
print("="*40)
print(f"Customer Type: {customer_type}")
print(f"Units Consumed: {units_consumed}")
print(f"Energy Charges (EC): ${ec:.2f}")
print(f"Fixed Charges (FC): ${fc:.2f}")
print(f"Customer Charges (CC): ${cc:.2f}")
print(f"Electricity Duty (ED): ${ed:.2f}")
print("-"*40)
print(f"TOTAL BILL AMOUNT: ${total_bill:.2f}")
print("="*40)
```

```
PS C:\Users\shash>  c:; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\sha
========================================
Customer Type: Domestic
Units Consumed: 130.0
Energy Charges (EC): $160.00
Fixed Charges (FC): $100.00
Customer Charges (CC): $50.00
Electricity Duty (ED): $16.00
----------------------------------------
TOTAL BILL AMOUNT: $326.00
========================================
```

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