ASSIGNMENT – 3.3

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Batch-10

Task-1

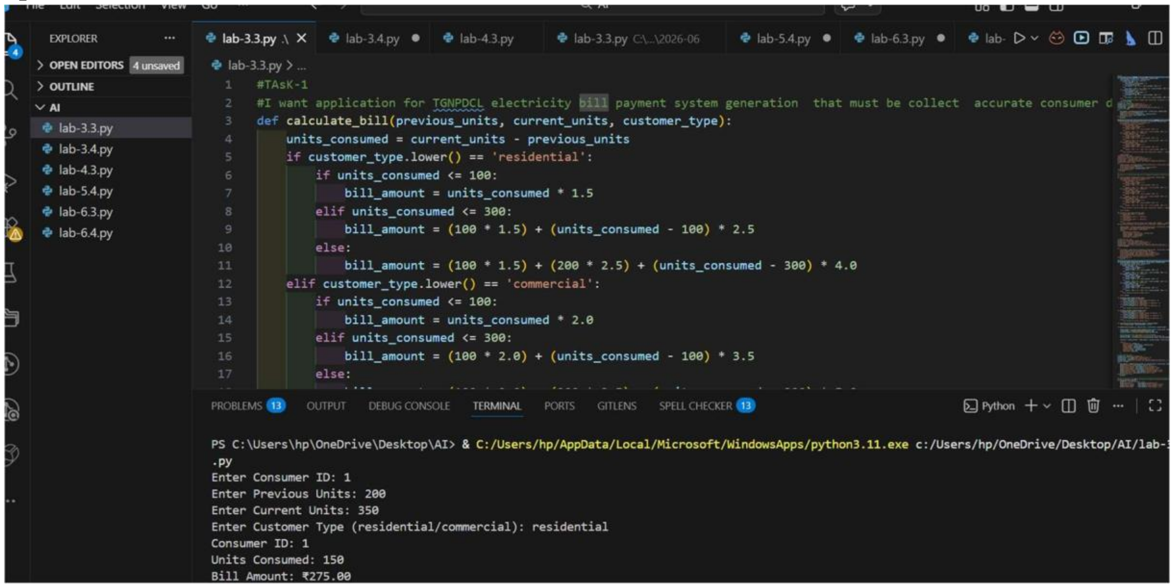
Prompt: I want an application for the TGNPDCL electricity bill payment system generation that must collect accurate consumer data, that needs previous units, current units, and the type of customer, code in python langauage.

Code :

```
def calculate_bill(previous_units, current_units, customer_type):
    units_consumed = current_units - previous_units
if customer_type.lower() == 'residential':        if
units_consumed <= 100:
            bill_amount = units_consumed * 1.5
elif units_consumed <= 300:
            bill_amount = (100 * 1.5) + (units_consumed - 100) * 2.5
        else:
            bill_amount = (100 * 1.5) + (200 * 2.5) + (units_consumed - 300) * 4.0
elif customer_type.lower() == 'commercial':        if units_consumed <= 100:
            bill_amount = units_consumed * 2.0
elif units_consumed <= 300:
            bill_amount = (100 * 2.0) + (units_consumed - 100) * 3.5
        else:
            bill_amount = (100 * 2.0) + (200 * 3.5) + (units_consumed - 300) * 5.0
    else:
        raise ValueError("Invalid customer type. Please enter 'residential' or 'commercial'.")
return bill_amount # Collecting user input consumer_id = input("Enter Consumer ID: ")
previous_units = int(input("Enter Previous Units: ")) current_units = int(input("Enter Current
Units: ")) customer_type = input("Enter Customer Type (residential/commercial): ")
```

```
# Calculating bill
try:
    bill_amount = calculate_bill(previous_units, current_units, customer_type)
print(f"Consumer ID: {consumer_id}")     print(f"Units Consumed:
{current_units - previous_units}")     print(f"Bill Amount:
₹{bill_amount:.2f}") except ValueError as e:
    print(e)
```

Output :



```
#TAsK-1
#I want application for TGNPDCL electricity bill payment system generation  that must be collect  accurate consumer d
def calculate_bill(previous_units, current_units, customer_type):
    units_consumed = current_units - previous_units
    if customer_type.lower() == 'residential':
        if units_consumed <= 100:
            bill_amount = units_consumed * 1.5
        elif units_consumed <= 300:
            bill_amount = (100 * 1.5) + (units_consumed - 100) * 2.5
        else:
            bill_amount = (100 * 1.5) + (200 * 2.5) + (units_consumed - 300) * 4.0
    elif customer_type.lower() == 'commercial':
        if units_consumed <= 100:
            bill_amount = units_consumed * 2.0
        elif units_consumed <= 300:
            bill_amount = (100 * 2.0) + (units_consumed - 100) * 3.5
        else:
```

```
PS C:\Users\hp\OneDrive\Desktop\AI> & C:/Users/hp/AppData/Local/Microsoft/WindowsApps/python3.11.exe c:/Users/hp/OneDrive/Desktop/AI/lab-
.py
Enter Consumer ID: 1
Enter Previous Units: 200
Enter Current Units: 350
Enter Customer Type (residential/commercial): residential
Consumer ID: 1
Units Consumed: 150
Bill Amount: ₹275.00
```

Code Analysis :

- The program uses a function calculate_bill() to separate billing logic from user input.
- Units consumed are calculated by subtracting previous units from current units.
- Nested if–elif conditions apply slab-based tariff rates.
- Customer type is normalized using .lower() to avoid case mismatch errors.
- Exception handling ensures invalid customer types are handled safely.

Task-2

Prompt: find code from Task-1 and extend it to find energy charges that were based on domestic, commercial, and industrial consumers in optimised condition statements in Python language.

Code :

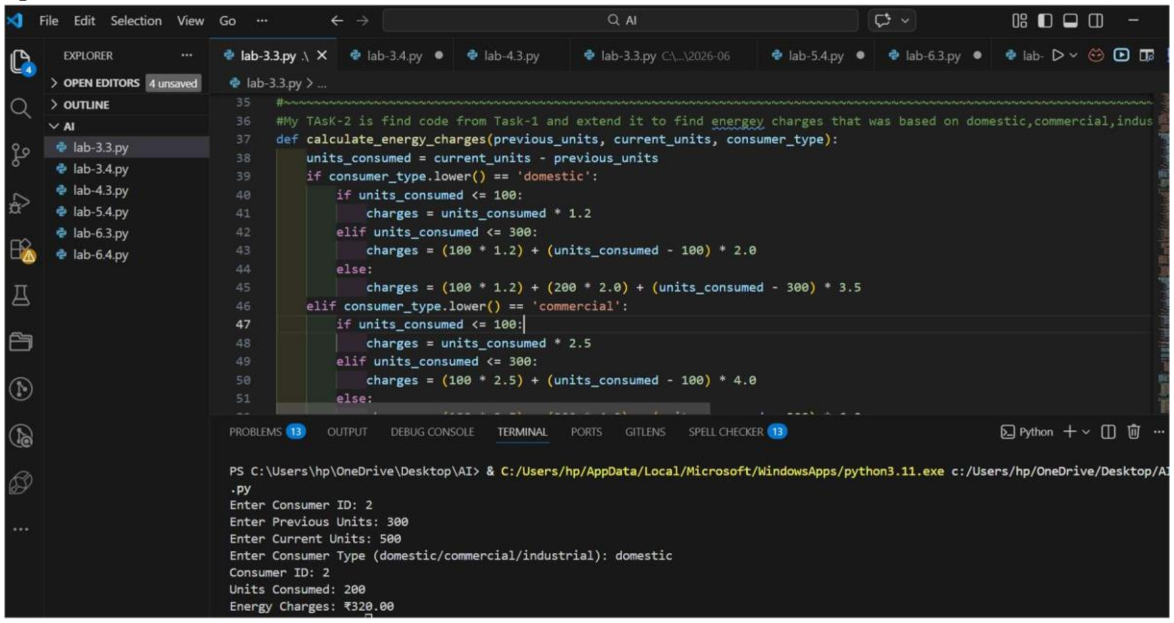
```
def calculate_energy_charges(previous_units, current_units, consumer_type):


    units_consumed = current_units - previous_units
if consumer_type.lower() == 'domestic':         if
units_consumed <= 100:
            charges = units_consumed * 1.2
        elif units_consumed <= 300:
            charges = (100 * 1.2) + (units_consumed - 100) * 2.0
        else:
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) *
3.5
    elif consumer_type.lower() == 'commercial':
        if units_consumed <= 100:
            charges = units_consumed * 2.5
elif units_consumed <= 300:
            charges = (100 * 2.5) + (units_consumed - 100) * 4.0
        else:
            charges = (100 * 2.5) + (200 * 4.0) + (units_consumed - 300) * 6.0
elif consumer_type.lower() == 'industrial':
if units_consumed <= 100:
charges = units_consumed * 3.0
elif units_consumed <= 300:
            charges = (100 * 3.0) + (units_consumed - 100) * 5.0
        else:
            charges = (100 * 3.0) + (200 * 5.0) + (units_consumed - 300) * 7.5
    else:
        raise ValueError("Invalid consumer type. Please enter 'domestic', 'commercial', or
```

'industrial'.")

return charges # Collecting user input consumer_id = input("Enter Consumer ID: ") previous_units = int(input("Enter Previous Units: ")) current_units = int(input("Enter Current Units: ")) consumer_type = input("Enter Consumer Type (domestic/commercial/industrial): ") #
Calculating energy charges
try:
energy_charges = calculate_energy_charges(previous_units, current_units, consumer_type) print(f"Consumer ID: {consumer_id}")
print(f"Units Consumed: {current_units - previous_units}")
print(f"Energy Charges: ₹{energy_charges:.2f}") except
ValueError as e:
print(e)

Output :



```
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
#My TAsK-2 is find code from Task-1 and extend it to find energey charges that was based on domestic,commercial,indus
def calculate_energy_charges(previous_units, current_units, consumer_type):
    units_consumed = current_units - previous_units
    if consumer_type.lower() == 'domestic':
        if units_consumed <= 100:
            charges = units_consumed * 1.2
        elif units_consumed <= 300:
            charges = (100 * 1.2) + (units_consumed - 100) * 2.0
        else:
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) * 3.5
    elif consumer_type.lower() == 'commercial':
        if units_consumed <= 100:
            charges = units_consumed * 2.5
        elif units_consumed <= 300:
            charges = (100 * 2.5) + (units_consumed - 100) * 4.0
        else:
```

```
PS C:\Users\hp\OneDrive\Desktop\AI> & C:/Users/hp/AppData/Local/Microsoft/WindowsApps/python3.11.exe c:/Users/hp/OneDrive/Desktop/AI
.py
Enter Consumer ID: 2
Enter Previous Units: 300
Enter Current Units: 500
Enter Consumer Type (domestic/commercial/industrial): domestic
Consumer ID: 2
Units Consumed: 200
Energy Charges: ₹320.00
```

Code Analysis :

- A single function, calculate_energy_charges() handles all consumer categories.
- Slab-based billing is implemented using structured conditional blocks.
- Logical grouping avoids redundant calculations.

- Function returns computed charges for further processing.
- Error handling improves robustness against invalid inputs.

Task-3

Prompt: find billing logic that must be reusable for multiple consumers, and that uses user-defined functions to calculate energy charges, fixed charges, and that should return values including meaningful comments in Python.

Code :

```
 def calculate_energy_charges(previous_units, current_units, consumer_type):
    units_consumed = current_units - previous_units
if consumer_type.lower() == 'domestic':         if
units_consumed <= 100:
            charges = units_consumed * 1 ........................................................................... 3
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) * 3      elif
consumer_type.lower() == 'commercial':  ......................................................................... 3
        if units_consumed <= 100:             charges = units_consumed * 2 ....................................... 3
        elif units_consumed <= 300:            charges = (100 * 2.5) + (units_consumed - 100) *
4.0         else:            charges = (100 * 2.5) + (200 * 4.0) + (units_consumed - 300) * 6.0
elif consumer_type.lower() == 'industrial':        if units_consumed <= 100:             charges =
units_consumed * 3.0        elif units_consumed <= 300:            charges = (100 * 3.0) +
(units_consumed - 100) * 5.0          else:            charges = (100 * 3.0) + (200 * 5.0) +
(units_consumed - 300) * 7 ......................................................................................... 3


        elif units_consumed <= 300:            charges = (100 * 1.2) + (units_consumed - 100) *
2.0         else:
    else:
        raise ValueError("Invalid consumer type. Please enter 'domestic', 'commercial', or
'industrial'.")

    return charges
```

```
def calculate_fixed_charges(consumer_type):
if consumer_type.lower() == 'domestic':
return 50.0     elif consumer_type.lower() ==
'commercial':         return 100.0     elif
consumer_type.lower() == 'industrial':
        return 150.0
else:

        raise ValueError("Invalid consumer type. Please enter 'domestic', 'commercial', or
'industrial'.") def generate_bill(consumer_id, previous_units, current_units,
consumer_type):


    energy_charges = calculate_energy_charges(previous_units,
current_units,  consumer_type)     fixed_charges =
calculate_fixed_charges(consumer_type)     total_bill = energy_charges +
fixed_charges     return {
        "Consumer ID": consumer_id,
        "Units Consumed": current_units - previous_units,
        "Energy Charges": energy_charges,
        "Fixed Charges": fixed_charges,
        "Total Bill": total_bill
    }
# Collecting user input consumer_id = input("Enter Consumer ID: ")
previous_units = int(input("Enter Previous Units: ")) current_units =
int(input("Enter Current Units: ")) consumer_type = input("Enter Consumer Type
(domestic/commercial/industrial): ") # Generating bill
 try:
    bill_details = generate_bill(consumer_id, previous_units, current_units,  consumer_type)
print(f"Consumer ID: {bill_details['Consumer ID']}")     print(f"Units Consumed:
{bill_details['Units
```

Consumed']}")   print(f"Energy Charges: ₹{bill_details['Energy

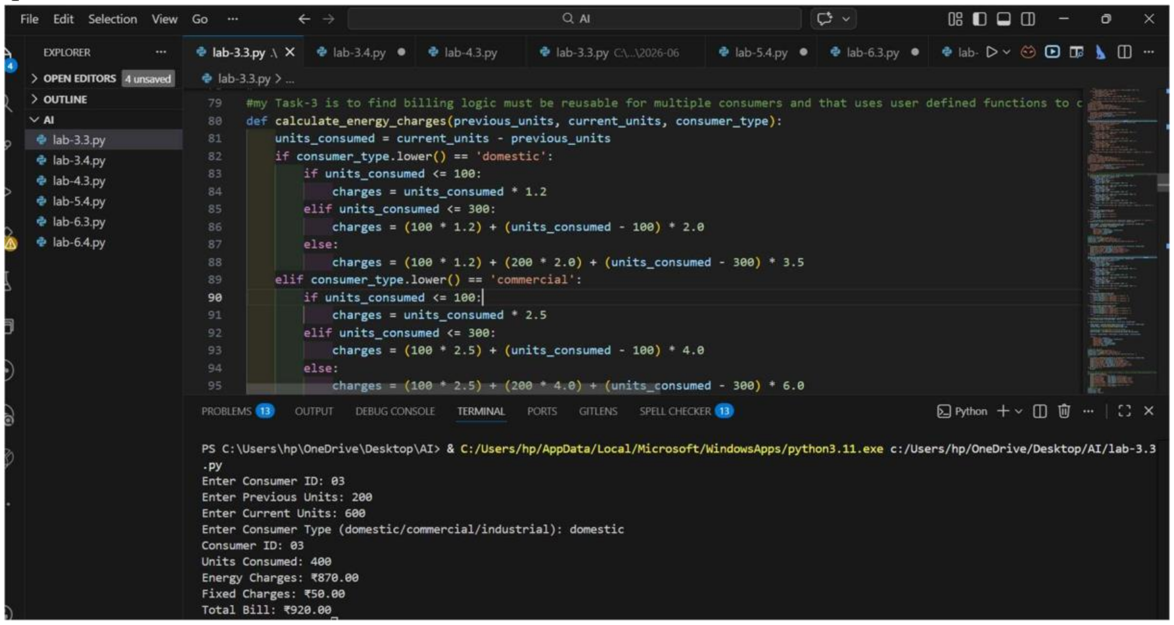
Charges']:.2f}")   print(f"Fixed Charges: ₹{bill_details['Fixed

Charges']:.2f}")   print(f"Total Bill: ₹{bill_details['Total

Bill']:.2f}") except ValueError as e:

    print(e)

Output :



```
#my Task-3 is to find billing logic must be reusable for multiple consumers and that uses user defined functions to c
def calculate_energy_charges(previous_units, current_units, consumer_type):
    units_consumed = current_units - previous_units
    if consumer_type.lower() == 'domestic':
        if units_consumed <= 100:
            charges = units_consumed * 1.2
        elif units_consumed <= 300:
            charges = (100 * 1.2) + (units_consumed - 100) * 2.0
        else:
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) * 3.5
    elif consumer_type.lower() == 'commercial':
        if units_consumed <= 100:
            charges = units_consumed * 2.5
        elif units_consumed <= 300:
            charges = (100 * 2.5) + (units_consumed - 100) * 4.0
        else:
            charges = (100 * 2.5) + (200 * 4.0) + (units_consumed - 300) * 6.0
```

```
PS C:\Users\hp\OneDrive\Desktop\AI> & C:/Users/hp/AppData/Local/Microsoft/WindowsApps/python3.11.exe c:/Users/hp/OneDrive/Desktop/AI/lab-3.3
.py
Enter Consumer ID: 03
Enter Previous Units: 200
Enter Current Units: 600
Enter Consumer Type (domestic/commercial/industrial): domestic
Consumer ID: 03
Units Consumed: 400
Energy Charges: ₹870.00
Fixed Charges: ₹50.00
Total Bill: ₹920.00
```

Code Analysis :

- ☐ Code is modularised using multiple user-defined functions.
- ☐ Energy charges and fixed charges are calculated independently.
- ☐ generate_bill() integrates all charge components into one structure.
- ☐ Dictionary return type improves readability and structured output.
- ☐ Design supports reuse for multiple consumers efficiently.

Task-4

Prompt: generate an electricity bill including multiple additional charges like fixed charges, customer charges, percentage of electricity duty, and duty calculation by improving accuracy.

Code :

```
def calculate_energy_charges(previous_units, current_units, consumer_type):
    units_consumed = current_units - previous_units
if consumer_type.lower() == 'domestic':         if
units_consumed <= 100:
            charges = units_consumed * 1.2
elif units_consumed <= 300:
            charges = (100 * 1.2) + (units_consumed - 100) * 2.0
        else:
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) * 3.5
elif consumer_type.lower() == 'commercial':         if units_consumed <=
100:              charges =
units_consumed * 2.5         elif
units_consumed <= 300:
            charges = (100 * 2.5) + (units_consumed - 100) * 4.0
        else:
            charges = (100 * 2.5) + (200 * 4.0) + (units_consumed - 300) * 6.0
elif consumer_type.lower() == 'industrial':         if units_consumed <=
100:              charges =
units_consumed * 3.5         elif
units_consumed <= 300:
            charges = (100 * 3.5) + (units_consumed - 100) * 5.5
        else:
            charges = (100 * 3.5) + (200 * 5.5) + (units_consumed - 300) * 7.5
    else:
        raise ValueError("Invalid consumer type.")


    return charges
```

```
def calculate_fixed_charges(consumer_type):
if consumer_type.lower() == 'domestic':
    return float(input("Enter Fixed Charges for Domestic: "))     elif
consumer_type.lower() == 'commercial':
    return float(input("Enter Fixed Charges for Commercial: "))
elif consumer_type.lower() == 'industrial':
    return float(input("Enter Fixed Charges for Industrial:
"))     else:          raise ValueError("Invalid consumer type.")

def calculate_customer_charges(consumer_type):
if consumer_type.lower() == 'domestic':
    return float(input("Enter Customer Charges for Domestic: "))
elif consumer_type.lower() == 'commercial':
    return float(input("Enter Customer Charges for Commercial: "))     elif
consumer_type.lower() == 'industrial':
    return float(input("Enter Customer Charges for Industrial: "))
  else:
    raise ValueError("Invalid consumer type.")

def calculate_electricity_duty(energy_charges, duty_percentage):
  return energy_charges * duty_percentage / float(1)

def     generate_bill(consumer_id,     previous_units,     current_units,     consumer_type):
energy_charges = calculate_energy_charges(previous_units, current_units, consumer_type)
fixed_charges    =    calculate_fixed_charges(consumer_type)               customer_charges    =
calculate_customer_charges(consumer_type)
```

```
    # Calculate electricity duty based on a fixed percentage     duty_percentage = 
float(input("Enter Electricity Duty Percentage: "))       electricity_duty = 
calculate_electricity_duty(energy_charges, duty_percentage)

    total_bill = energy_charges + fixed_charges + customer_charges + electricity_duty

    return {
        "Consumer ID": consumer_id,
        "Units Consumed": current_units - previous_units,
        "Energy Charges": energy_charges,
        "Fixed Charges": fixed_charges,
        "Customer Charges": customer_charges,
        "Electricity Duty": electricity_duty,
        "Total Bill": total_bill
    }

# Collecting user input consumer_id = input("Enter Consumer ID: ") 
previous_units = int(input("Enter Previous Units: "))        current_units = 
int(input("Enter Current Units: "))  consumer_type = input("Enter Consumer Type 
(domestic/commercial/industrial): ")
# Generating bill
try:
    bill_details = generate_bill(consumer_id, previous_units, current_units, consumer_type)
print(f"Consumer ID: {bill_details['Consumer ID']}")     print(f"Units Consumed: 
{bill_details['Units Consumed']}")     print(f"Energy Charges: ₹{bill_details['Energy 
Charges']:.2f}")     print(f"Fixed Charges: ₹{bill_details['Fixed Charges']:.2f}") 
print(f"Customer Charges: ₹{bill_details['Customer Charges']:.2f}")      print(f"Electricity Duty:
```

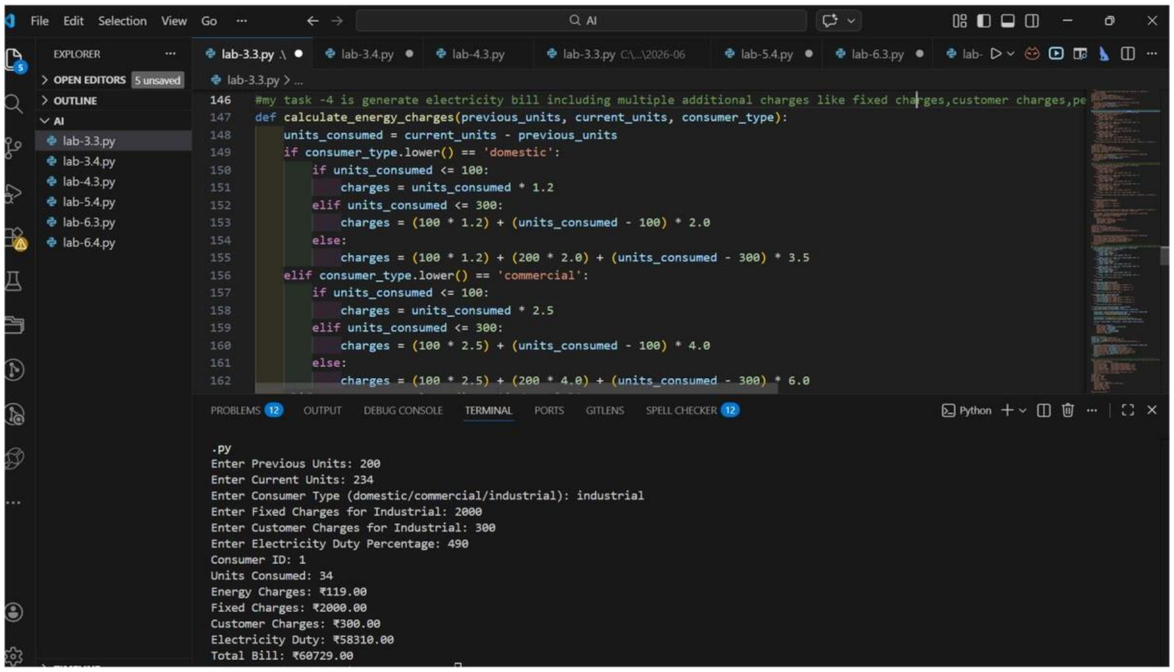
₹{bill_details['Electricity Duty']:.2f}")   print(f"Total Bill: ₹{bill_details['Total Bill']:.2f}")

except

ValueError as e:

    print(e) Output

:



```
#my task -4 is generate electricity bill including multiple additional charges like fixed charges,customer charges,pe
def calculate_energy_charges(previous_units, current_units, consumer_type):
    units_consumed = current_units - previous_units
    if consumer_type.lower() == 'domestic':
        if units_consumed <= 100:
            charges = units_consumed * 1.2
        elif units_consumed <= 300:
            charges = (100 * 1.2) + (units_consumed - 100) * 2.0
        else:
            charges = (100 * 1.2) + (200 * 2.0) + (units_consumed - 300) * 3.5
    elif consumer_type.lower() == 'commercial':
        if units_consumed <= 100:
            charges = units_consumed * 2.5
        elif units_consumed <= 300:
            charges = (100 * 2.5) + (units_consumed - 100) * 4.0
        else:
            charges = (100 * 2.5) + (200 * 4.0) + (units_consumed - 300) * 6.0
```

```
.py
Enter Previous Units: 200
Enter Current Units: 234
Enter Consumer Type (domestic/commercial/industrial): industrial
Enter Fixed Charges for Industrial: 2000
Enter Customer Charges for Industrial: 300
Enter Electricity Duty Percentage: 490
Consumer ID: 1
Units Consumed: 34
Energy Charges: ₹119.00
Fixed Charges: ₹2000.00
Customer Charges: ₹300.00
Electricity Duty: ₹58310.00
Total Bill: ₹60729.00
```

Code Analysis :

- Additional charge components are added through dedicated functions.
- Electricity duty is computed as a percentage of energy charges.
- Dynamic user input improves billing accuracy and flexibility.
- Functions maintain separation of concerns for clarity.
- The total bill aggregates all computed components systematically.

Task 5

Prompt: generate the final bill of electricity, including all charges, with proper formatting and display in Python language.

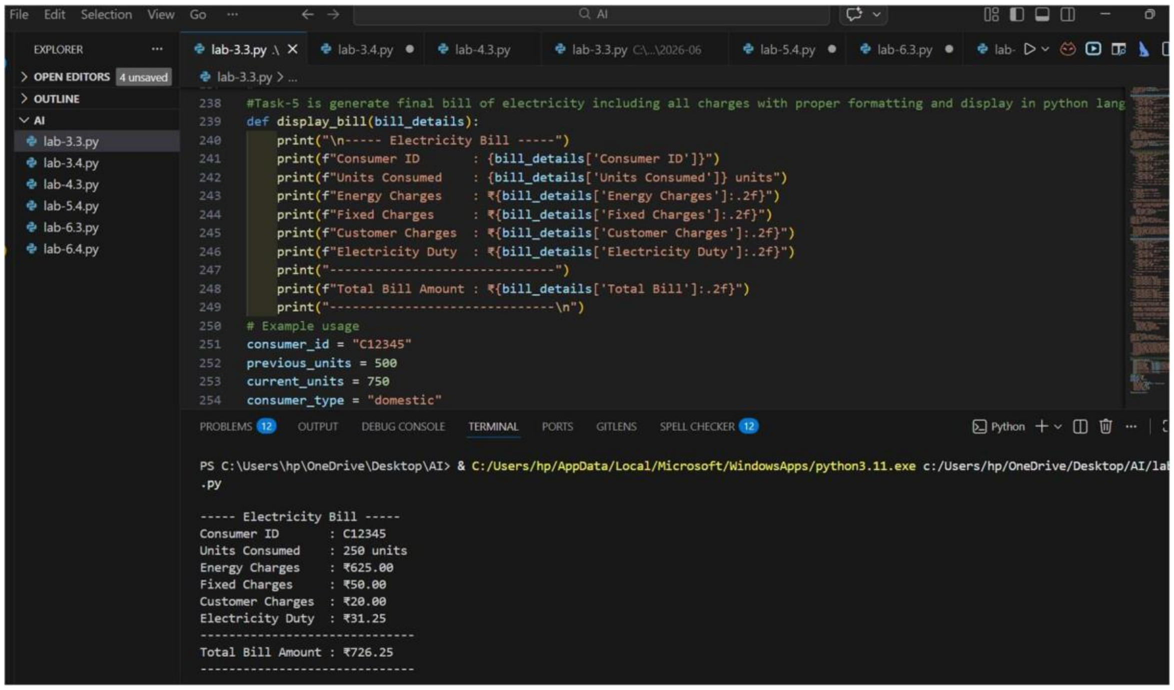
code :   ef display_bill(bill_details):

    print("\n----- Electricity Bill -----")   print(f"Consumer

ID   : {bill_details['Consumer ID']}")   print(f"Units

```
Consumed    : {bill_details['Units Consumed']} units")
print(f"Energy Charges    : ₹{bill_details['Energy
Charges']:.2f}")     print(f"Fixed Charges      :
₹{bill_details['Fixed Charges']:.2f}")     print(f"Customer
Charges  : ₹{bill_details['Customer Charges']:.2f}")
print(f"Electricity Duty  : ₹{bill_details['Electricity
Duty']:.2f}")     print("------------------------------")
print(f"Total Bill Amount : ₹{bill_details['Total Bill']:.2f}")
    print("------------------------------\n")
# Example usage consumer_id
= "C12345"   previous_units =
500     current_units = 750
consumer_type = "domestic"
bill_details = {
    "Consumer ID": consumer_id,
    "Units Consumed": current_units - previous_units,
    "Energy Charges": 625.00,
    "Fixed Charges": 50.00,
    "Customer Charges": 20.00,
    "Electricity Duty": 31.25,
    "Total Bill": 726.25
} display_bill(bill_details)
```

Output :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lab-3.4.py
lab-4.3.py
lab-5.4.py
lab-6.3.py
lab-6.4.py
lab-3.3.py C:\...\2026-06
lab-3.3.py > ...
PROBLEMS 12 OUTPUT DEBUG CONSOLE TERMINAL PORTS GITLENS SPELL CHECKER 12
Python

```python
#Task-5 is generate final bill of electricity including all charges with proper formatting and display in python lang
def display_bill(bill_details):
    print("\n----- Electricity Bill -----")
    print(f"Consumer ID       : {bill_details['Consumer ID']}")
    print(f"Units Consumed    : {bill_details['Units Consumed']} units")
    print(f"Energy Charges    : ₹{bill_details['Energy Charges']:.2f}")
    print(f"Fixed Charges     : ₹{bill_details['Fixed Charges']:.2f}")
    print(f"Customer Charges  : ₹{bill_details['Customer Charges']:.2f}")
    print(f"Electricity Duty  : ₹{bill_details['Electricity Duty']:.2f}")
    print("-----------------------------")
    print(f"Total Bill Amount : ₹{bill_details['Total Bill']:.2f}")
    print("-----------------------------\n")
# Example usage
consumer_id = "C12345"
previous_units = 500
current_units = 750
consumer_type = "domestic"
```

```
PS C:\Users\hp\OneDrive\Desktop\AI> & C:/Users/hp/AppData/Local/Microsoft/WindowsApps/python3.11.exe c:/Users/hp/OneDrive/Desktop/AI/la
.py

----- Electricity Bill -----
Consumer ID       : C12345
Units Consumed    : 250 units
Energy Charges    : ₹625.00
Fixed Charges     : ₹50.00
Customer Charges  : ₹20.00
Electricity Duty  : ₹31.25
-----------------------------
Total Bill Amount : ₹726.25
-----------------------------
```

Code Analysis :

- Display logic is isolated in the display_bill() function.
- Formatted printing ensures professional bill presentation.
- Uses dictionary keys to access bill components safely.
- Separation of calculation and presentation improves maintainability.
- Supports easy modification for real-world billing systems.