

## **ASSIGNMENT \_3-3**

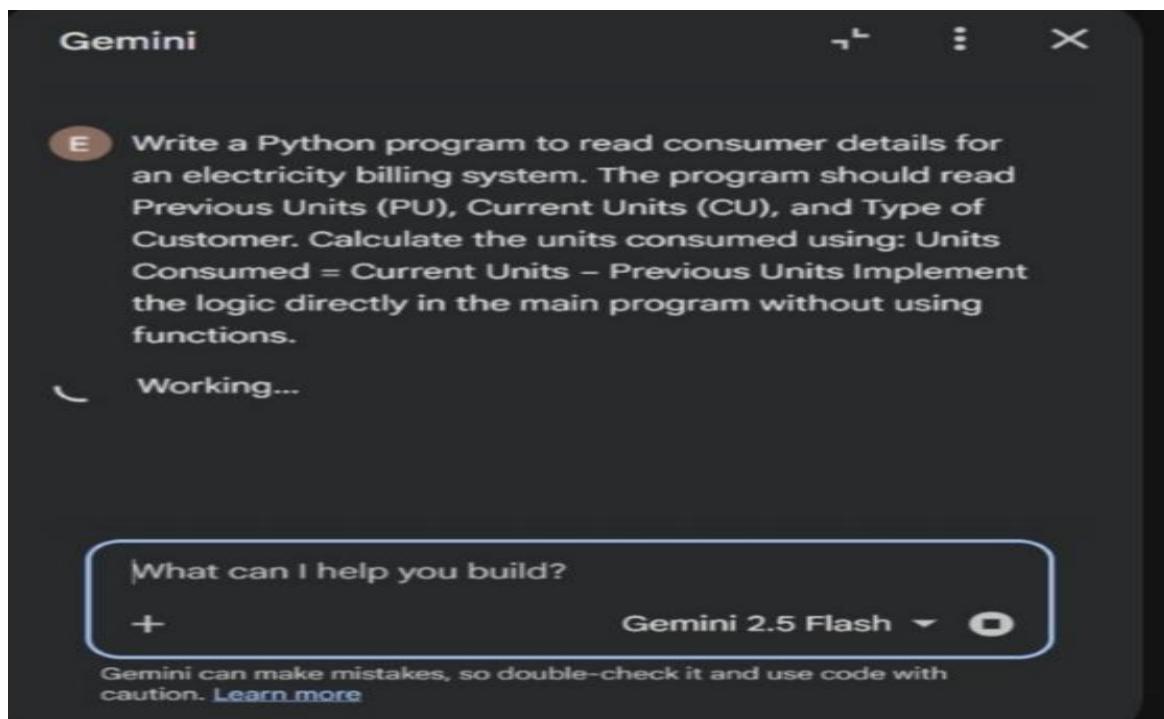
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**Batch:05**

**Task 1: AI-Generated Logic for Reading Consumer Details.**

**PROMPT:**



**CODE:**

```
[1] # Get input from the user
previous_units_str = input("Enter previous units: ")
current_units_str = input("Enter current units: ")
customer_type = input("Enter type of customer (e.g., Residential, Commercial, Industrial): ")

# Convert units to integers
try:
    previous_units = int(previous_units_str)
    current_units = int(current_units_str)
except ValueError:
    print("Invalid input for units. Please enter whole numbers.")
    exit()

# Calculate units consumed
if current_units >= previous_units:
    units_consumed = current_units - previous_units
else:
    print("Error: Current units cannot be less than previous units.")
    exit()

# Display the results
print("\n--- Electricity Bill Summary ---")
print(f"Previous Units: {previous_units}")
print(f"Current Units: {current_units}")
print(f"Customer Type: {customer_type}")
print(f"Units Consumed: {units_consumed}")

... Enter previous units: 90
Enter current units: 120
```

## OUTPUT:

```
... Enter previous units: 90
Enter current units: 120
Enter type of customer (e.g., Residential, Commercial, Industrial): Residential

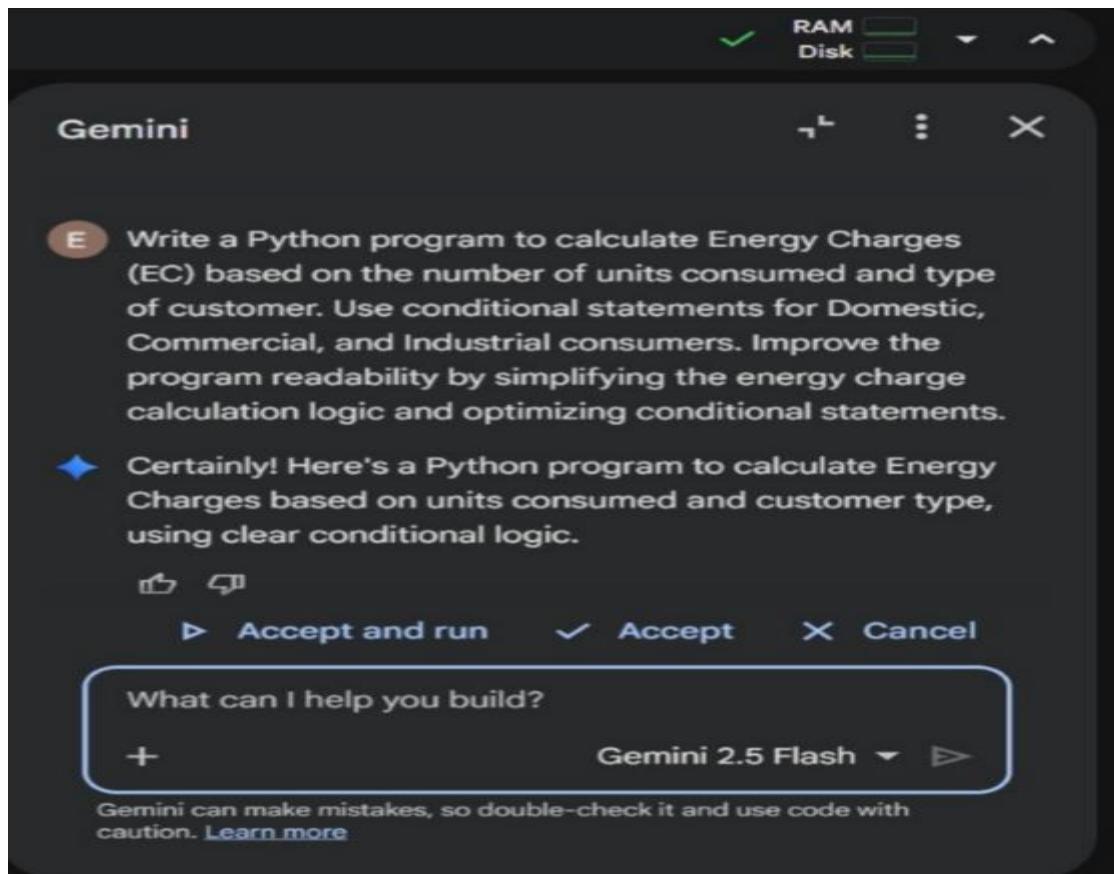
--- Electricity Bill Summary ---
Previous Units: 90
Current Units: 120
Customer Type: Residential
Units Consumed: 30
```

## EXPLANATION:

- The program first reads the previous meter reading.
- It then reads the current meter reading.
- The type of customer (Domestic / Commercial / Industrial) is taken as input.
- Units consumed are calculated by subtracting previous units from current units.
- Finally, the program displays the customer type and total units consumed.

## Task 2: Energy Charges Calculation Based on Units Consumed.

### PROMPT:



### CODE:

```

❶ # Get input from the user
previous_units_str = input("Enter previous units: ")
current_units_str = input("Enter current units: ")
customer_type = input("Enter type of customer (Domestic, Commercial, Industrial): ")

# Convert units to integers
try:
    previous_units = int(previous_units_str)
    current_units = int(current_units_str)
except ValueError:
    print("Invalid input for units. Please enter whole numbers.")
    exit()

# Calculate units consumed
if current_units >= previous_units:
    units_consumed = current_units - previous_units
else:
    print("Error: Current units cannot be less than previous units.")
    exit()

# Initialize energy charges and rate
energy_charges = 0.0
rate_per_unit = 0.0

# Calculate energy charges based on customer type
# Using .lower() to make the input case-insensitive
if customer_type.lower() == "domestic":
    rate_per_unit = 2.0
    energy_charges = units_consumed * rate_per_unit
elif customer_type.lower() == "commercial":
    rate_per_unit = 5.0
    energy_charges = units_consumed * rate_per_unit
elif customer_type.lower() == "industrial":
    rate_per_unit = 8.0
    energy_charges = units_consumed * rate_per_unit
else:
    print(f"Invalid customer type entered: {customer_type}. Please choose Domestic, Commercial, or Industrial.")
    exit()

# Display the results
print("\n--- Electricity Bill Summary ---")
print(f"Customer Type: {customer_type}")
print(f"Previous Units: {previous_units}")
print(f"Current Units: {current_units}")
print(f"Units Consumed: {units_consumed}")
print(f"Rate per Unit ({customer_type}): ${rate_per_unit:.2f}")
print(f"Total Energy Charges: ${energy_charges:.2f}")

Token: previous_units -> previous_units

```

## OUTPUT:

```

*** Enter previous units: 120
Enter current units: 159
Enter type of customer (Domestic, Commercial, Industrial): Commercial

--- Electricity Bill Summary ---
Customer Type: Commercial
Previous Units: 120
Current Units: 159
Units Consumed: 39
Rate per Unit (Commercial): $5.00
Total Energy Charges: $195.00

```

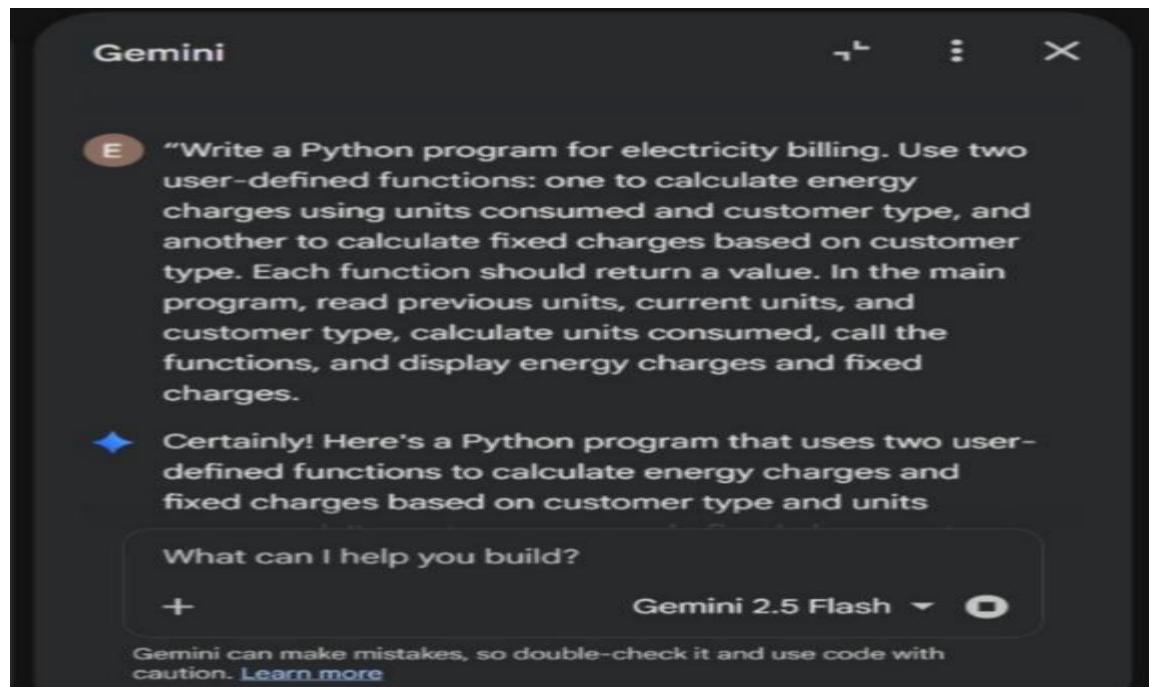
## EXPLANATION

- The program takes previous meter reading and current meter reading as input.
- It also takes the type of customer (Domestic, Commercial, or Industrial).
- The program calculates units consumed by subtracting previous units from current units.
- Using if–else conditions, it selects the rate based on customer type.

- Energy charges are calculated by multiplying units consumed  $\times$  rate.
- Finally, the program displays the customer type, units consumed, and energy charges.
- All logic is written inside the main method without using functions.
- The program is simple and easy to understand for beginners.

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

### PROMPT:



### CODE:

```
❶ def calculate_energy_charges(units_consumed, customer_type):
    """Calculates energy charges based on units consumed and customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        rate_per_unit = 2.0
    elif customer_type == "commercial":
        rate_per_unit = 5.0
    elif customer_type == "industrial":
        rate_per_unit = 8.0
    else:
        return 0.0, 0.0 # Invalid type, return 0 charges and 0 rate
    energy_charges = units_consumed * rate_per_unit
    return energy_charges, rate_per_unit

❷ def calculate_fixed_charges(customer_type):
    """Calculates fixed charges based on customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        fixed_charge = 50.0
    elif customer_type == "commercial":
        fixed_charge = 100.0
    elif customer_type == "industrial":
        fixed_charge = 200.0
    else:
        return 0.0 # Invalid type, return 0 fixed charge
    return fixed_charge

❸ # --- Main Program ---

❹ # Get input from the user
previous_units_str = input("Enter previous units: ")
current_units_str = input("Enter current units: ")
customer_type_input = input("Enter type of customer (Domestic, Commercial, Industrial): ")

❺ # Convert units to integers
try:
    previous_units = int(previous_units_str)
    current_units = int(current_units_str)
except ValueError:
    print("Invalid input for units. Please enter whole numbers.")
    exit()

❻ # Calculate units consumed
if current_units >= previous_units:
    units_consumed = current_units - previous_units
else:
    print("Error: Current units cannot be less than previous units.")
    exit()

❼ # Call functions to calculate charges
energy_charges, rate_per_unit = calculate_energy_charges(units_consumed, customer_type_input)
fixed_charges = calculate_fixed_charges(customer_type_input)

❽ # Check for invalid customer type from functions
if energy_charges == 0.0 and rate_per_unit == 0.0 and fixed_charges == 0.0:
    print("Invalid customer type entered: (customer_type_input). Please choose Domestic, Commercial, or Industrial.")
    exit()

❾ # Display the results
```

## OUTPUT:

```
*** Enter previous units: 100
Enter current units: 120
Enter type of customer (Domestic, Commercial, Industrial): Domestic

--- Electricity Bill Summary ---
Customer Type: Domestic
Previous Units: 100
Current Units: 120
Units Consumed: 20
Rate per Unit (Domestic): $2.00
Energy Charges: $40.00
Fixed Charges: $50.00
Total Bill: $90.00
```

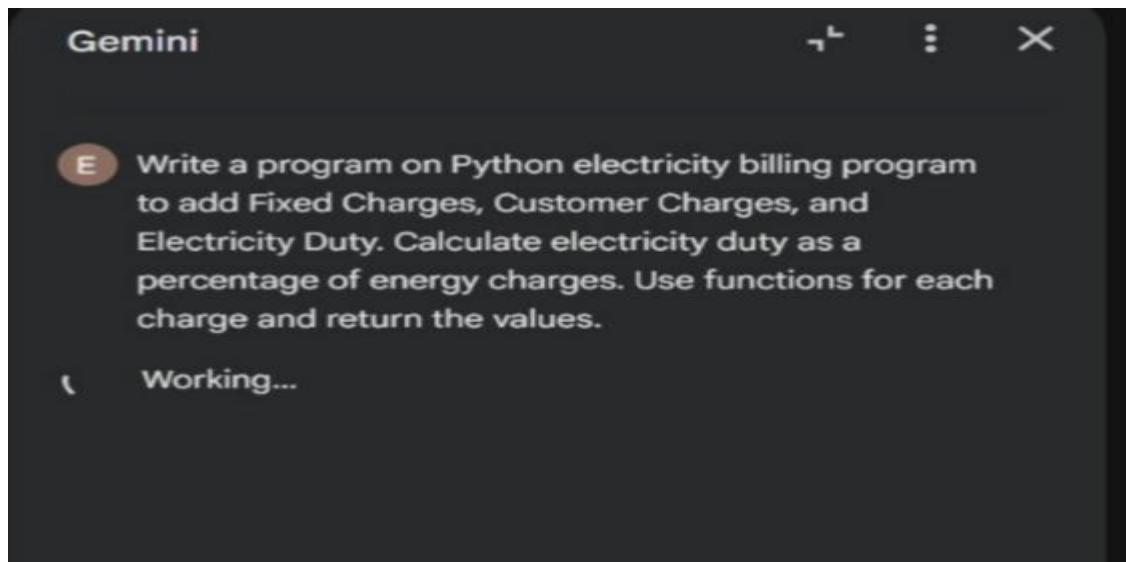
## EXPLANATION:

- The program calculates an electricity bill.
- It uses functions so the same logic can be used again.
- One function calculates energy charges.
- Another function calculates fixed charges.
- Functions return the calculated values.

- The main program reads previous units, current units, and customer type.
- It finds units consumed.
- It calls the functions to get charges.
- Finally, it displays energy charges and fixed charges.

## Task 4: Calculation of Additional Charges

PROMPT:



CODE:

```

def calculate_energy_charges(units_consumed, customer_type):
    """Calculates energy charges based on units consumed and customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        rate_per_unit = 2.0
    elif customer_type == "commercial":
        rate_per_unit = 5.0
    elif customer_type == "industrial":
        rate_per_unit = 8.0
    else:
        return 0.0 # Invalid type, return 0 charges and 0 rate
    energy_charges = units_consumed * rate_per_unit
    return energy_charges, rate_per_unit

def calculate_fixed_charges(customer_type):
    """Calculates fixed charges based on customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        return 0.0
    elif customer_type == "commercial":
        return 100.0
    elif customer_type == "industrial":
        return 200.0
    else:
        return 0.0 # Invalid type, return 0 fixed charge

def calculate_customer_charges(customer_type):
    """Calculates total charges based on customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        return 0.0
    elif customer_type == "commercial":
        return 200.0
    elif customer_type == "industrial":
        return 500.0
    else:
        return 0.0 # Invalid type, return 0 customer charge

def calculate_electricity_duty(energy_charges, customer_type):
    """Calculates electricity duty as a percentage of energy charges based on customer type."""
    customer_type = customer_type.lower()
    if customer_type == "domestic":
        duty_percentage = 0.05 # 5%
    elif customer_type == "commercial":
        duty_percentage = 0.08 # 8%
    elif customer_type == "industrial":
        duty_percentage = 0.10 # 10%
    else:
        return 0.0 # Invalid type, return 0 duty
    electricity_duty = energy_charges * duty_percentage
    return electricity_duty, duty_percentage

# --- Main Program ---

# Get Input from the user
previous_units_str = input("Enter previous units: ")
current_units_str = input("Enter current units: ")
customer_type_input = input("Enter type of customer (Domestic, Commercial, Industrial): ")

# Convert units to integers
try:
    previous_units = int(previous_units_str)
    current_units = int(current_units_str)
except ValueError:
    print("Please provide valid input for units. Please enter whole numbers.")
    exit()

# Calculate units consumed
if current_units > previous_units:
    units_consumed = current_units - previous_units
else:
    print("Error: Current units cannot be less than previous units.")
    exit()

# Call Functions to calculate charges
energy_charges = calculate_energy_charges(units_consumed, customer_type_input)
fixed_charges = calculate_fixed_charges(customer_type_input)
customer_charges = calculate_customer_charges(customer_type_input)
electricity_duty, duty_percentage = calculate_electricity_duty(energy_charges, customer_type_input)

# Check for invalid customer type from function
if (customer_type_input != "Domestic" and customer_type_input != "Commercial" and customer_type_input != "Industrial"):
    print("Invalid customer type entered: (" + customer_type_input + "). Please choose Domestic, Commercial, or Industrial..")
    exit()

# Display the results
print("Electricity Bill Summary:")
print("Customer Type: " + customer_type_input.capitalize())
print("Previous Units: " + str(previous_units))
print("Current Units: " + str(current_units))
print("Units Consumed: " + str(units_consumed))
print("Rate per Unit: (" + customer_type_input.capitalize() + ") $" + str(rate_per_unit) + ".00")
print("Energy Charges: $" + str(energy_charges))
print("Fixed Charges: $" + str(fixed_charges))
print("Customer Charges: $" + str(customer_charges))
print("Electricity Duty: $" + str(electricity_duty))
print("Total Electricity Bill: $" + str(total_bill))

# --- Test the electricity billing program with a different customer type ---

# --- Add error handling for invalid unit inputs ---

# --- Gemini can make mistakes, so double-check it and use code with caution. Learn more ---

```

```

# --- Calculated electricity duty as a percentage of energy charges based on customer type. ---
# --- If customer_type == "domestic": ---
# ---     rate_per_unit = 2.0 ---
# --- elif customer_type == "commercial": ---
# ---     rate_per_unit = 5.0 ---
# --- elif customer_type == "industrial": ---
# ---     rate_per_unit = 8.0 ---
# --- else: ---
# ---     return 0.0 # Invalid type, return 0 charges and 0 rate ---
# --- energy_charges = units_consumed * rate_per_unit ---
# --- return energy_charges, rate_per_unit ---

# --- Calculates fixed charges based on customer type. ---
# --- If customer_type == "domestic": ---
# ---     return 0.0 ---
# --- elif customer_type == "commercial": ---
# ---     return 100.0 ---
# --- elif customer_type == "industrial": ---
# ---     return 200.0 ---
# --- else: ---
# ---     return 0.0 # Invalid type, return 0 fixed charge ---

# --- Calculates total charges based on customer type. ---
# --- If customer_type == "domestic": ---
# ---     return 0.0 ---
# --- elif customer_type == "commercial": ---
# ---     return 200.0 ---
# --- elif customer_type == "industrial": ---
# ---     return 500.0 ---
# --- else: ---
# ---     return 0.0 # Invalid type, return 0 customer charge ---

# --- Calculates electricity duty as a percentage of energy charges based on customer type. ---
# --- If customer_type == "domestic": ---
# ---     duty_percentage = 0.05 # 5% ---
# --- elif customer_type == "commercial": ---
# ---     duty_percentage = 0.08 # 8% ---
# --- elif customer_type == "industrial": ---
# ---     duty_percentage = 0.10 # 10% ---
# --- else: ---
# ---     return 0.0 # Invalid type, return 0 duty ---
# --- electricity_duty = energy_charges * duty_percentage ---
# --- return electricity_duty, duty_percentage ---

# --- Main Program ---

# Get Input from the user
previous_units_str = input("Enter previous units: ")
current_units_str = input("Enter current units: ")
customer_type_input = input("Enter type of customer (Domestic, Commercial, Industrial): ")

# Convert units to integers
try:
    previous_units = int(previous_units_str)
    current_units = int(current_units_str)
except ValueError:
    print("Please provide valid input for units. Please enter whole numbers.")
    exit()

# Calculate units consumed
if current_units > previous_units:
    units_consumed = current_units - previous_units
else:
    print("Error: Current units cannot be less than previous units.")
    exit()

# Call Functions to calculate charges
energy_charges = calculate_energy_charges(units_consumed, customer_type_input)
fixed_charges = calculate_fixed_charges(customer_type_input)
customer_charges = calculate_customer_charges(customer_type_input)
electricity_duty, duty_percentage = calculate_electricity_duty(energy_charges, customer_type_input)

# Check for invalid customer type from function
if (customer_type_input != "Domestic" and customer_type_input != "Commercial" and customer_type_input != "Industrial"):
    print("Invalid customer type entered: (" + customer_type_input + "). Please choose Domestic, Commercial, or Industrial..")
    exit()

# Display the results
print("Electricity Bill Summary:")
print("Customer Type: " + customer_type_input.capitalize())
print("Previous Units: " + str(previous_units))
print("Current Units: " + str(current_units))
print("Units Consumed: " + str(units_consumed))
print("Rate per Unit: (" + customer_type_input.capitalize() + ") $" + str(rate_per_unit) + ".00")
print("Energy Charges: $" + str(energy_charges))
print("Fixed Charges: $" + str(fixed_charges))
print("Customer Charges: $" + str(customer_charges))
print("Electricity Duty: $" + str(electricity_duty))
print("Total Bill: $" + str(total_bill))

# --- Test the electricity billing program with a different customer type ---

# --- Add error handling for invalid unit inputs ---

# --- Gemini can make mistakes, so double-check it and use code with caution. Learn more ---

```

## OUTPUT:

```
... Enter previous units: 100
Enter current units: 200
Enter type of customer (Domestic, Commercial, Industrial): Industrial

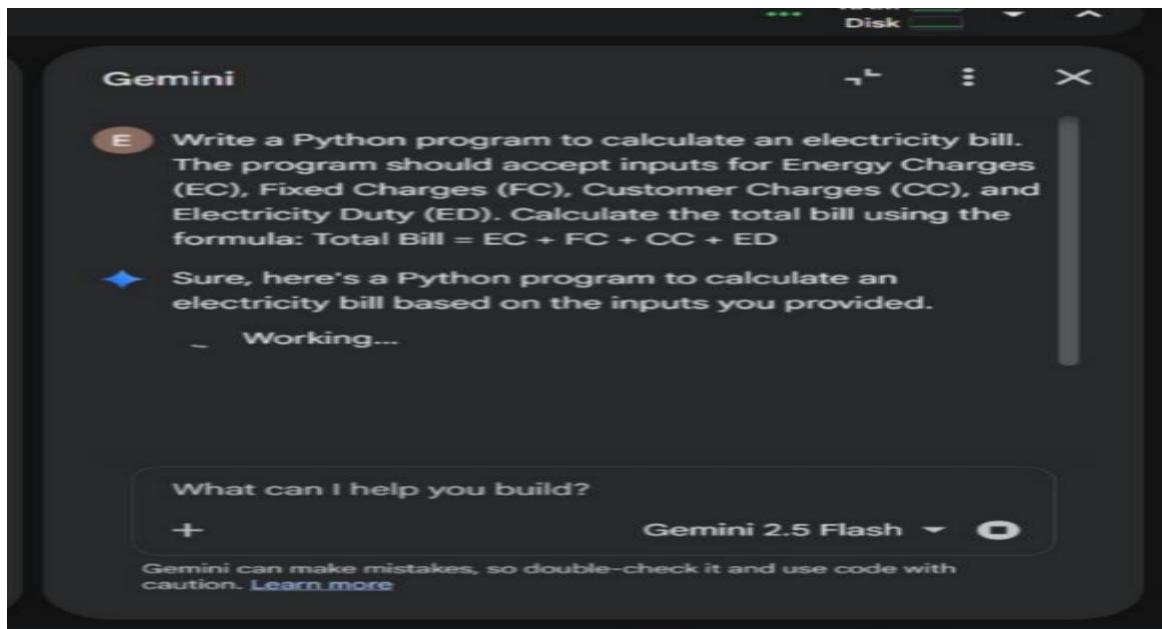
--- Electricity Bill Summary ---
Customer Type: Industrial
Previous Units: 100
Current Units: 200
Units Consumed: 100
Rate per Unit (Industrial): $8.00
Energy Charges: $800.00
Fixed Charges: $200.00
Customer Charges: $50.00
Electricity Duty (10% of Energy Charges): $80.00
Total Bill: $1130.00
```

## EXPLANATION

- The program calculates an electricity bill.
- It uses functions to calculate different charges so the logic can be reused.
- There is a function for Energy Charges (EC), based on units used and customer type.
- Another function calculates Fixed Charges (FC) and another for Customer Charges (CC).
- Electricity Duty (ED) is calculated as a percentage of Energy Charges.
- The program first reads previous units, current units, and customer type.
- It finds units consumed and calls the functions to get all charges.
- Finally, it prints all charges separately in a clear and readable way.
- The program is simple, reusable, and easy to understand.

## **Task 5: Final Bill Generation and Output Analysis**

### **PROMPT:**



## CODE:

The screenshot shows a Google Colab notebook titled "week 3-3.ipynb". The code cell contains the same Python function and input handling as the previous screenshot. To the right of the code cell is a Gemini sidebar with the following text:

E Write a Python program to calculate an electricity bill. The program should accept inputs for Energy Charges (EC), Fixed Charges (FC), Customer Charges (CC), and Electricity Duty (ED). Calculate the total bill using the formula: Total Bill = EC + FC + CC + ED

◆ Sure, here's a Python program to calculate an electricity bill based on the inputs you provided.

The electricity bill has been successfully calculated. Based on the inputs you provided:

- Energy Charges (EC): \$100.00 - Fixed Charges (FC): \$100.00 - Fixed Charges (FC): \$200.00
- Customer Charges (CC): \$30.00 - Electricity Duty (ED): \$30.00 - Electricity Duty (ED): \$24.00

The Total Electricity Bill is \$354.00.

Below the sidebar are three buttons: "Explain the function 'calculate\_electricity\_bill'", "Modify the code to accept inputs as parameters", and "Add more test cases for the 'calculate\_electricity\_bill' function".

## OUTPUT:

```
... Enter Energy Charges (EC): 100  
Enter Fixed Charges (FC): 200  
Enter Customer Charges (CC): 30  
Enter Electricity Duty (ED): 24
```

```
Total Electricity Bill: $354.00
```

+ Code

+ Text

## EXPLANATION:

- Takes user input for Energy Charges (EC), Fixed Charges (FC), Customer Charges (CC), and Electricity Duty (ED).
- Stores each value in a separate variable for clarity.
- Calculates the total electricity bill by adding all charges.
- Uses the formula: Total Bill = EC + FC + CC + ED.
- Displays each charge clearly.
- Displays the final total bill amount.
- Uses simple logic and readable variable names.
- Represents a real-world electricity billing process.