

NAME :O.ISRAEL

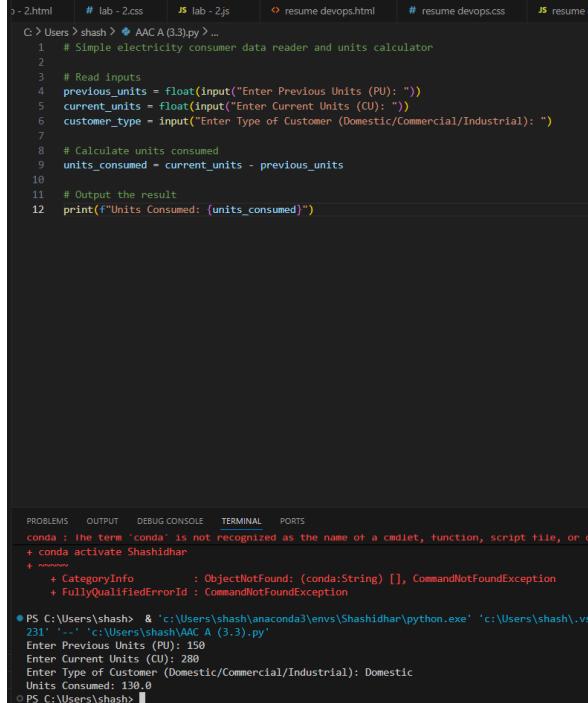
HALL NO : 2303A51825

ASSIGNMENT-3.3

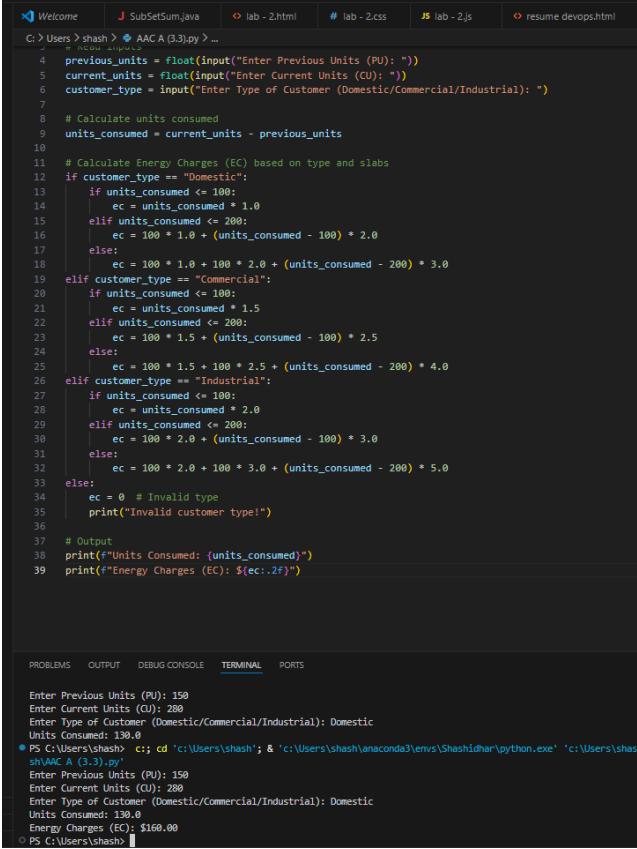
SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
Program Name: B. Tech		Assignment Type: Lab	
Course Coordinator Name		Dr. Rishabh Mittal	
Instructor(s) Name		Mr. S Naresh Kumar Ms. B. Swathi Dr. Sasanko Shekhar Gantayat Mr. Md Sallauddin Dr. Mathivanan 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	<p>Lab 3: Application for TGNPDCL – Electricity Bill Generation Using Python & AI Tools</p> <p>Lab Objectives</p> <ul style="list-style-type: none"> 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 <p>Lab Outcomes (LOs)</p> <p>After completing this lab, students will be able to:</p>	Week2 - Wednesday

ASSIGNMENT-3.3

	<ul style="list-style-type: none"> • 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 	
	<p>Task 1: AI-Generated Logic for Reading Consumer Details</p> <p>Scenario</p> <p>An electricity billing system must collect accurate consumer data.</p> <p>Task Description</p> <p>Use an AI tool (GitHub Copilot / Gemini) to generate a Python program that:</p> <ul style="list-style-type: none"> • Reads: <ul style="list-style-type: none"> ◦ Previous Units (PU) ◦ Current Units (CU) ◦ Type of Customer • Calculates units consumed • Implements logic directly in the main program (no functions) <p>Expected Output</p> <ul style="list-style-type: none"> • Correct input reading • Units consumed calculation • Screenshot showing AI-generated code • Sample input and output 	
	<p>Task 2: Energy Charges Calculation Based on Units Consumed</p> <p>Scenario</p> <p>Energy charges depend on the number of units consumed and customer type.</p> <p>Task Description</p> <p>Review the AI-generated code from Task 1 and extend it to:</p> <ul style="list-style-type: none"> • Calculate Energy Charges (EC) • Use conditional statements based on: <ul style="list-style-type: none"> ◦ Domestic ◦ Commercial ◦ Industrial consumers • Improve readability using AI prompts such as: 	

ASSIGNMENT-3.3

	<ul style="list-style-type: none"> ○ "Simplify energy charge calculation logic" ○ "Optimize conditional statements" <p>Expected Output</p> <ul style="list-style-type: none"> • Correct EC calculation • Clear conditional logic • Original and improved versions (optional) • Sample execution results  <pre> 1 Welcome J SubSetSum.java O lab - 2.html # lab - 2.css JS lab - 2.js resume devops.html 2 3 C:> Users> shash > AAC A (3.3).py > ... 4 previous_units = float(input("Enter Previous Units (PU): ")) 5 current_units = float(input("Enter Current Units (CU): ")) 6 customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ") 7 8 # Calculate units consumed 9 units_consumed = current_units - previous_units 10 11 # Calculate Energy Charges (EC) based on type and slabs 12 if customer_type == "Domestic": 13 if units_consumed <= 100: 14 ec = units_consumed * 1.0 15 elif units_consumed <= 200: 16 ec = 100 * 1.0 + (units_consumed - 100) * 2.0 17 else: 18 ec = 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0 19 elif customer_type == "Commercial": 20 if units_consumed <= 100: 21 ec = units_consumed * 1.5 22 elif units_consumed <= 200: 23 ec = 100 * 1.5 + (units_consumed - 100) * 2.5 24 else: 25 ec = 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0 26 elif customer_type == "Industrial": 27 if units_consumed <= 100: 28 ec = units_consumed * 2.0 29 elif units_consumed <= 200: 30 ec = 100 * 2.0 + (units_consumed - 100) * 3.0 31 else: 32 ec = 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0 33 else: 34 ec = 0 # Invalid type 35 print("Invalid customer type!") 36 37 # Output 38 print("Units Consumed: {units_consumed}") 39 print("Energy Charges (EC): \${ec:.2f}") </pre> <p>PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS</p> <pre> Enter Previous Units (PU): 150 Enter Current Units (CU): 200 Enter Type of Customer (Domestic/Commercial/Industrial): Domestic Units Consumed: 150 Enter Previous Units (PU): 150 Enter Current Units (CU): 200 Enter Type of Customer (Domestic/Commercial/Industrial): Domestic Units Consumed: 150 Energy Charges (EC): \$100.00 PS C:\Users\shash> </pre>	
	<p>Task 3: Modular Design Using AI Assistance (Using Functions)</p> <p>Scenario</p> <p>Billing logic must be reusable for multiple consumers.</p> <p>Task Description</p> <p>Use AI assistance to generate a Python program that:</p> <ul style="list-style-type: none"> • Uses user-defined functions to: <ul style="list-style-type: none"> ○ Calculate Energy Charges ○ Calculate Fixed Charges • Returns calculated values • Includes meaningful comments <p>Expected Output</p> <ul style="list-style-type: none"> • Function-based Python program • Correct EC and FC values • Screenshots of AI-assisted function generation • Test cases with outputs 	

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HALL NO : 2303A51825

ASSIGNMENT-3.3

```
C:\> Users > shash > AAC A (3.3).py > ...
1 # Modular Electricity Billing System
2
3 def calculate_energy_charges(customer_type, units_consumed):
4 """
5 Calculate Energy Charges based on customer type and units consumed.
6 Slabs: Domestic (1/2/3), Commercial (2/5/4), Industrial (2/3/5) per unit tiers.
7 """
8 if customer_type == "Domestic":
9     if units_consumed <= 100:
10         return units_consumed * 1.0
11     elif units_consumed <= 200:
12         return 100 * 1.0 + (units_consumed - 100) * 2.0
13     else:
14         return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
15 elif customer_type == "Commercial":
16     if units_consumed <= 100:
17         return units_consumed * 1.5
18     elif units_consumed <= 200:
19         return 100 * 1.5 + (units_consumed - 100) * 2.5
20     else:
21         return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
22 elif customer_type == "Industrial":
23     if units_consumed <= 100:
24         return units_consumed * 2.0
25     elif units_consumed <= 200:
26         return 100 * 2.0 + (units_consumed - 100) * 3.0
27     else:
28         return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
29
30 return 0 # Invalid type
31
32 def calculate_fixed_charges(customer_type):
33 """
34 Calculate Fixed Charges based on customer type.
35 Domestic: $100, Commercial: $200, Industrial: $300.
36 """
37 if customer_type == "Domestic":
38     return 100.0
39 elif customer_type == "Commercial":
40     return 200.0
41 elif customer_type == "Industrial":
42     return 300.0
43
44 return 0 # Invalid type
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

shVAC A (3.3).py*
UnitConsumed: 130.0
Energy Charges (EC): $100.00
PS C:\Users\shash> cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\ShashiDhar\python.exe' 'c:\Users\shash\shVAC A (3.3).py'
Enter Previous Units (PU): 150
Enter Current Units (CU): 200
Enter Type of Customer (Domestic/Commercial/Industrial): Domestic
Units Consumed: 130.0
Energy Charges (EC): $100.00
Fixed Charges (FC): $100.00
PS C:\Users\shash> |
```



```
Welcome J SubSetSum.java ⇝ lab - 2.html # lab - 2.css JS lab - 2.js ⇝ resume dev
C:\> Users > shash > AAC A (3.3).py > ...
3 def calculate_energy_charges(customer_type, units_consumed):
25     elif units_consumed <= 200:
26         return 100 * 2.0 + (units_consumed - 100) * 3.0
27     else:
28         return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
29
30 return 0 # Invalid type
31
32 def calculate_fixed_charges(customer_type):
33 """
34 Calculate Fixed Charges based on customer type.
35 Domestic: $100, Commercial: $200, Industrial: $300.
36 """
37 if customer_type == "Domestic":
38     return 100.0
39 elif customer_type == "Commercial":
40     return 200.0
41 elif customer_type == "Industrial":
42     return 300.0
43
44 # Main program
45 previous_units = float(input("Enter Previous Units (PU): "))
46 current_units = float(input("Enter Current Units (CU): "))
47 customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ")
48
49 units_consumed = current_units - previous_units
50 ec = calculate_energy_charges(customer_type, units_consumed)
51 fc = calculate_fixed_charges(customer_type)
52
53 print(f"Units Consumed: {units_consumed}")
54 print(f"Energy Charges (EC): ${ec:.2f}")
55 print(f"Fixed Charges (FC): ${fc:.2f}")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\shash> cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\ShashiDhar\python.exe' 'c:\Users\shash\shVAC A (3.3).py'
Fixed Charges (FC): $100.00
PS C:\Users\shash> cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\ShashiDhar\python.exe' 'c:\Users\shash\shVAC 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): $500.00
Fixed Charges (FC): $200.00
```

ASSIGNMENT-3.3

	<p>Task 4: Calculation of Additional Charges</p> <p>Scenario</p> <p>Electricity bills include multiple additional charges.</p> <p>Task Description</p> <p>Extend the program to calculate:</p> <ul style="list-style-type: none"> • FC – Fixed Charges • CC – Customer Charges • ED – Electricity Duty (percentage of EC) <p>Use AI prompts like:</p> <ul style="list-style-type: none"> • <i>"Add electricity duty calculation"</i> • <i>"Improve billing accuracy"</i> <p>Expected Output</p> <ul style="list-style-type: none"> • Individual charge values printed • Correct duty calculation • Well-structured output • Verified intermediate results <pre>C:\Users\shash> python AAC A (3).py ... 1 # Extended Electricity Billing with Additional Charges 2 3 def calculate_energy_charges(customer_type, units_consumed): 4 """ 5 Calculate Energy Charges based on customer type and units consumed. 6 Slabs: Domestic (1/2/3), Commercial (1.5/2.5/4), Industrial (2/3/5) per unit tiers. 7 """ 8 if customer_type == "Domestic": 9 if units_consumed <= 100: 10 return units_consumed * 1.0 11 elif units_consumed <= 200: 12 return 100 * 1.0 + (units_consumed - 100) * 2.0 13 else: 14 return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0 15 elif customer_type == "Commercial": 16 if units_consumed <= 100: 17 return units_consumed * 1.5 18 elif units_consumed <= 200: 19 return 100 * 1.5 + (units_consumed - 100) * 2.5 20 else: 21 return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0 22 elif customer_type == "Industrial": 23 if units_consumed <= 100: 24 return units_consumed * 2.0 25 elif units_consumed <= 200: 26 return 100 * 2.0 + (units_consumed - 100) * 3.0 27 else: 28 return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0 29 return 0 # Invalid type 30 31 def calculate_fixed_charges(customer_type): 32 """ 33 Calculate Fixed Charges based on customer type. 34 Domestic: \$100, Commercial: \$200, Industrial: \$300. 35 """ 36 if customer_type == "Domestic": 37 return 100.0 38 elif customer_type == "Commercial": 39 return 200.0 40 elif customer_type == "Industrial": 41 return 300.0 42 return 0 # Invalid type 43 44 PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS conda : The term 'conda' is not recognized as the name of a cmdlet, function, script file, or operable program + FullyQualifiedErrorId : CommandNotFound Exception ● 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): 200 Enter Type of Customer (Domestic/Commercial/Industrial): Domestic Units Consumed: 150.0 Energy Charges (EC): \$150.00 Fixed Charges (FC): \$100.00 Customer Charges (CC): \$50.00 Electricity Duty (ED): \$16.00 ○ PS C:\Users\shash></pre>
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ASSIGNMENT-3.3

The screenshot shows a terminal window with the following content:

```
C:\> Users> bash > AAC A (3).py > ...
31 def calculate_fixed_charges(customer_type):
32     return 100.0
33     elif customer_type == "Commercial":
34         return 200.0
35     elif customer_type == "Industrial":
36         return 300.0
37     return 0 # Invalid type
38
39 def calculate_customer_charges():
40     """Fixed Customer Charges: $50 for all types."""
41     return 50.0
42
43 def calculate_electricity_duty(ec):
44     """Electricity Duty: 10% of Energy Charges."""
45     return 0.10 * ec
46
47
48 # Main program
49 previous_units = float(input("Enter Previous Units (PU): "))
50 current_units = float(input("Enter Current Units (CU): "))
51 customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ").strip()
52
53 if customer_type not in ["Domestic", "Commercial", "Industrial"]:
54     print("Invalid type! Defaulting to Domestic.")
55     customer_type = "Domestic"
56
57 units_consumed = current_units - previous_units
58 ec = calculate_energy_charges(customer_type, units_consumed)
59 fc = calculate_fixed_charges(customer_type)
60 cc = calculate_customer_charges()
61 ed = calculate_electricity_duty(ec)
62
63 # Print individual charges
64 print(f"Units Consumed: {units_consumed}")
65 print(f"Energy Charges (EC): ${ec:.2f}")
66 print(f"Fixed Charges (FC): ${fc:.2f}")
67 print(f"Customer Charges (CC): ${cc:.2f}")
68 print(f"Electricity Duty (ED): ${ed:.2f}")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
error : The term 'conan' is not recognized as the name of a cmdlet, function, script file, or operable program
+ FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\shash> & 'C:\Users\shash\anaconda3\envs\shashidhar\python.exe' 'c:\Users\shash\vscode\extensi...
Enter Previous Units (PU): 150
Enter Current Units (CU): 200
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

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ASSIGNMENT-3.3

```
C:\> Users > shash > AACA (3.3).py > ...
1  # Final Electricity Bill Generator
2
3  def calculate_energy_charges(customer_type, units_consumed):
4      """
5          Calculate Energy Charges based on customer type and units consumed.
6          Slabs: Domestic (1/2/3), Commercial (1.5/2.5/4), Industrial (2/3/5) per unit tiers.
7      """
8      if customer_type == "Domestic":
9          if units_consumed <= 100:
10              return units_consumed * 1.0
11          elif units_consumed <= 200:
12              return 100 * 1.0 + (units_consumed - 100) * 2.0
13          else:
14              return 100 * 1.0 + 100 * 2.0 + (units_consumed - 200) * 3.0
15      elif customer_type == "Commercial":
16          if units_consumed <= 100:
17              return units_consumed * 1.5
18          elif units_consumed <= 200:
19              return 100 * 1.5 + (units_consumed - 100) * 2.5
20          else:
21              return 100 * 1.5 + 100 * 2.5 + (units_consumed - 200) * 4.0
22      elif customer_type == "Industrial":
23          if units_consumed <= 100:
24              return units_consumed * 2.0
25          elif units_consumed <= 200:
26              return 100 * 2.0 + (units_consumed - 100) * 3.0
27          else:
28              return 100 * 2.0 + 100 * 3.0 + (units_consumed - 200) * 5.0
29      return 0
30
31  def calculate_fixed_charges(customer_type):
32      """Fixed Charges: Domestic $100, Commercial $200, Industrial $300."""
33      if customer_type == "Domestic":
34          return 100.0
35      elif customer_type == "Commercial":
36          return 200.0
37      elif customer_type == "Industrial":
38          return 300.0
39      return 0
40
41  def calculate_customer_charges():
42      """Final Customer Charges: ECA """
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
● PS C:\Users\shash> c;; cd 'c:\Users\shash'; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\AACA (3.3).py'
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
```

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ASSIGNMENT-3.3

The screenshot shows a terminal window with the following content:

```
C:\Users> shash > AAC A (3.3).py >_
31 def calculate_fixed_charges(customer_type):
32     return 0
33
34 def calculate_customer_charges():
35     """Fixed Customer Charges: $50."""
36     return 50.0
37
38 def calculate_electricity_duty(ec):
39     """Electricity Duty: 10% of EC."""
40     return 0.10 * ec
41
42 # Main program
43 previous_units = float(input("Enter Previous Units (PU): "))
44 current_units = float(input("Enter Current Units (CU): "))
45 customer_type = input("Enter Type of Customer (Domestic/Commercial/Industrial): ").strip()
46
47 if customer_type not in ["Domestic", "Commercial", "Industrial"]:
48     print("Invalid type! Defaulting to Domestic.")
49     customer_type = "Domestic"
50
51 units_consumed = current_units - previous_units
52 ec = calculate_energy_charges(customer_type, units_consumed)
53 fc = calculate_fixed_charges(customer_type)
54 cc = calculate_customer_charges()
55 ed = calculate_electricity_duty(ec)
56 total_bill = ec + fc + cc + ed
57
58 # Nicely formatted bill display
59 print("\n" + "="*40)
60 print("ELECTRICITY BILL SUMMARY")
61 print("="*40)
62 print(f"Customer Type: {customer_type}")
63 print(f"Units Consumed: {units_consumed}")
64 print(f"Energy Charges (EC): ${ec:.2f}")
65 print(f"Fixed Charges (FC): ${fc:.2f}")
66 print(f"Customer Charges (CC): ${cc:.2f}")
67 print(f"Electricity Duty (ED): ${ed:.2f}")
68 print("-"*40)
69 print(f"TOTAL BILL AMOUNT: ${total_bill:.2f}")
70 print("="*40)
```

TERMINAL PORTS

```
PS C:\Users\shash> c:; cd "c:\Users\shash"; & 'c:\Users\shash\anaconda3\envs\Shashidhar\python.exe' 'c:\Users\shash\AAC A (3.3).py'
=====
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.