VIT®
BHOPAL

Introduction to
Problem Solving and Programming
(CSE1021)

Project Report

On

CAFE BILLING SOFTWARE

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1. Abstract

The Cafe Billing & Management System is a command-line application developed in Python. It aims to automate the order-taking and billing process for a small cafe ('NIKHIL's CAFE'). The system provides a digital menu, accepts user inputs for orders, calculates taxes and totals, and generates a timestamped receipt. This reduces manual calculation errors and improves service speed.

2. Introduction

In the hospitality industry, efficiency is key. Traditional paper-based ordering systems are prone to human error, illegible handwriting, and slow calculation times. With the advent of digital solutions, cafes can streamline their operations.

This project utilizes Python's core features—dictionaries for data storage, loops for continuous operation, and exception handling for robust input validation—to create a seamless experience for both the cashier and the customer.

3. Problem Statement

The Problem: Manual billing in cafes leads to:

1. Calculation mistakes during rush hours.
2. Difficulty in updating menu prices physically.
3. Lack of proper records for sales.
4. Time consumption in writing receipts by hand.

4. Objectives

The primary objectives of this project are:

• To Create a Digital Menu: Display items and prices clearly.
• To Automate Calculations: Ensure 100% accuracy in bill totaling.
• To Validate Inputs: Prevent system crashes if a user enters invalid data (e.g., text instead of numbers).
• To Generate Receipts: Provide a professional summary of the transaction.

5. System Requirements

Hardware:
• Processor: Intel Core i3 or higher.
• RAM: 4GB minimum.
• Storage: 100MB free space.

Software:
• Operating System: Windows/Linux/MacOS.
• Language: Python 3.8+.
• Libraries: datetime (Standard Library).

6. System Architecture (Algorithm)

The program follows a linear control flow with a central loop for order taking:

Step 1: Initialization
Define the MENU dictionary containing Item Codes, Names, and Prices.

Step 2: Display
Call display_menu() to show the available options to the user.

Step 3: Order Loop
Enter a while True loop.
- Prompt for Item Code.
- If 'q', break loop.
- If valid code, prompt for Quantity.
- Calculate Cost (Price * Qty).
- Append to order_list.

Step 4: Billing
Call print_bill() to iterate through order_list and display the final total with a timestamp.

7. Implementation Details

The project is built using procedural programming paradigms. Key Python concepts used include:

7.1 Data Structures

Dictionary (MENU): Used to store product data. Key=ID, Value=Nested Dictionary containing 'item' and 'price'. This allows O(1) time complexity for looking up prices.

List (order_list): Used to store the customer's selected items dynamically as they order.

7.2 Exception Handling

To ensure the system doesn't crash, try...except ValueError blocks are used. If a user enters 'two' instead of '2' for quantity, the system catches the error and prompts a friendly warning.

7.3 Formatting

f-strings (Formatted String Literals) are used extensively for aligning columns in the menu and bill (e.g., {:<15} for left alignment).

8. Source Code

The complete source code for 'Nikhil's Cafe Management System' is provided below:

```
import datetime

MENU = {
    "1": {"item": "Patties", "price": 45},
    "2": {"item": "Cold Coffee", "price": 140},
    "3": {"item": "pizza", "price": 350},
    "4": {"item": "cheese Maggi", "price": 80},
    "5": {"item": "Masala Tea", "price": 40},
    "6": {"item": "Veg Burger", "price": 100},
    "7": {"item": "French Fries", "price": 90},
    "8": {"item": "Chocolate Shake", "price": 150},
    "9": {"item": "Grilled Sandwich", "price": 120},
    "10": {"item": "Aaloo paratha", "price": 130}
}

def display_menu():
    print("\n" + "="*35)
    print("NIKHIL's CAFE ")
    print("="*35)
    print(f"{'Code':<5} | {'Item Name':<15} | {'Price'}")
    print("-" * 35)
    for key, val in MENU.items():
        print(f"{key:<5} | {val['item']:<15} | Rs {val['price']}")
    print("-" * 35)

def take_order():
    order_list = []
    total_amount = 0
    while True:
        print("\n(Type 'q' to finish order)")
        code = input("Enter Item Code: ").lower()
        if code == 'q':
            break
        if code in MENU:
            item_name = MENU[code]['item']
            price = MENU[code]['price']
            try:
                qty = int(input(f"How many {item_name}? "))
                if qty > 0:
                    cost = price * qty
                    order_list.append({"item": item_name, "qty": qty, "cost": cost})
                    total_amount += cost
                    print(f"--> Added: {qty} x {item_name}")
                else:
                    print("Quantity 1 se kam nahi ho sakti!")
            except ValueError:
                print("Error: Number daalo bhai!")
        else:
            print("Wrong Code! Menu check karo.")
    return order_list, total_amount

def print_bill(orders, total):
    if not orders:
        print("\nKoi order nahi diya. Thank you!")
        return
    print("\n\n")
    print("=" * 40)
```

```
    print("         OFFICIAL RECEIPT")
    print(f" Time: {datetime.datetime.now().strftime('%Y-%m-%d %H:%M')}")
    print("=" * 40)
    print(f"{'Item':<15} | {'Qty':<5} | {'Cost'}")
    print("-" * 40)
    for order in orders:
        print(f"{order['item']:<15} | {order['qty']:<5} | Rs {order['cost']}")
    print("-" * 40)
    print(f"GRAND TOTAL: Rs {total}")
    print("=" * 40)
    print("   Pay at Counter. Thank You!!!    ")

if __name__ == "__main__":
    display_menu()
    my_orders, bill_total = take_order()
    print_bill(my_orders, bill_total)
```

9. Output & Screenshots

Below is a simulation of the console output during a runtime session:

```
==================================
NIKHIL's CAFE
==================================
Code  | Item Name       | Price
----------------------------------
1 2   | Patties         |  Rs  45
3     | Cold Coffee     | Rs 140
...   | pizza           | Rs 350
10
      | Aaloo paratha   | Rs 130
----------------------------------

(Type 'q' to finish order)
Enter Item Code: 2
How many Cold Coffee? 2
--> Added: 2 x Cold Coffee

(Type 'q' to finish order)
Enter Item Code: 4
How many cheese Maggi? 1
--> Added: 1 x cheese Maggi

(Type 'q' to finish order)
Enter Item Code: q

========================================
         OFFICIAL RECEIPT
 Time: 2025-12-01 14:30
========================================
Item            | Qty   | Cost
----------------------------------------
Cold Coffee     |  2    | Rs 280
cheese Maggi    | 1     | Rs 80
----------------------------------------
GRAND TOTAL: Rs 360
========================================
   Pay at Counter. Thank You!!!
```

10. Testing & Validation

The system was rigorously tested using the following test cases:

Test Case	Input Code: 1,	Expected Output	Status
Valid Order	Qty: 2 Code:	Total: 90	Passed
Invalid Code	99 Qty: 'abc'	Msg: Wrong Code!	Passed
Invalid Qty Type	Qty: -5 Code:	Msg: Error: Number daalo!	Passed
Negative Qty	'q'	Msg: Quantity > 1	Passed
Exit Command		Terminate Loop & Print Bill	Passed

11. Future Scope

While the current system functions well for basic needs, future enhancements could include:

- **GUI Implementation:** Using Tkinter to replace the command line.
- **Database Integration:** Using SQL to save sales history permanently.
- **GST Calculation:** Adding a separate logic for tax calculation.
- **Stock Management:** Reducing available quantity when an item is sold.

12. Conclusion

The 'Cafe Billing & Management System' successfully achieves its goal of simplifying the ordering process. It handles multiple items, calculates totals accurately, and provides a formatted receipt.

This project provided valuable hands-on experience with Python dictionaries, list manipulation, and control structures. It serves as a foundational model that can be expanded into a commercial-grade application.

References

1. Python 3.10 Official Documentation.
2. VIT Bhopal 'Problem Solving and Programming' Course Material.
3. StackOverflow for DateTime formatting techniques.