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Samayapuram, Tiruchirappalli – 621 112, Tamilnadu, India.

A Project Report on

Supermarket Billing System

Submitted in partial fulfillment of requirements for the award of the course

of

CGB1201 – JAVA PROGRAMMING

Under the guidance of

Mrs. P. GEETHA, M.E.,

Submitted By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

K. RAMAKRISHNAN COLLEGE OF ENGINEERING
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TRICHY-621 112

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K. RAMAKRISHNAN COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this project report on **" SUPERMARKET BILLING SYSTEM"** is the bonafide work of **DHARANI T (8115U23AM016)** who carried out the project work during the academic year 2024 - 2025 under my supervision.

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Submitted for the End Semester Examination held on …….

INTERNAL EXAMINER **EXTERNAL EXAMINER**

DECLARATION

I jointly declare that the project report **on "SUPERMARKET BILLING SYSTEM"** is the result of original work done by us and best of our knowledge, similar work has not been submitted to

"**ANNA UNIVERSITY CHENNAI**" for the requirement of Degree of BACHELOR OF ENGINEERING.

This project report is submitted on the partial fulfillment of the requirement of the award of the course

CGB1201- JAVA PROGRAMMING

Place: Samayapuram
Date:

SIGNATURE

DHARANI T

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"K.RAMAKRISHNANCOLLEGEOFENGINEERING(Autonomous)",

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INSTITUTE VISION AND MISSION

VISION OF THE INSTITUTE:

To achieve a prominent position among the top technical institutions.

MISSION OF THE INSTIITUTE:

M1: To best owstandard technical education parexcellence through state of the art infrastructure, competent faculty and high ethical standards.

M2: To nurture research and entrepreneurial skills among students in cutting edge technologies.

M3: To provide education for developing high-quality professionals to transform the society.

DEPARTMENT VISION AND MISSION

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE AND MACHINELEARNING)

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To become a renowned hub for Artificial Intelligence and Machine Learning Technologies to produce highly talented globally recognizable technocrats to meet Industrial needs and societal expectations.

Mission of the Department

M1: To impart advanced education in Artificial Intelligence and Machine Learning, Built upon a foundation in Computer Science and Engineering.

M2: To foster Experiential learning equips students with engineering skills to Tackle realworld problems.

M3: To promote collaborative innovation in Artificial Intelligence, machine Learning, and related research and development with industries.

M4: To provide an enjoyable environment for pursuing excellence while upholdin Strong personal and professional values and ethics.

Programme Educational Objectives (PEOs):

Graduates will be able to:

PEO1: Excel in technical abilities to build intelligent systems in the fields of Artificial Intelligence and Machine Learning in order to find new opportunities.

PEO2: Embrace new technology to solve real-world problems, whether alone or As a team, while prioritizing ethics and societal benefits.

PEO3: Accept lifelong learning to expand future opportunities in research and Product development.

Programme Specific Outcomes (PSOs):

PSO1: Ability to create and use Artificial Intelligence and Machine Learning Algorithms, including supervised and unsupervised learning, reinforcement Learning, and deep learning models.

PSO2: Ability to collect, pre-process, and analyze large datasets, including data Cleaning, feature engineering, and data visualization..

PROGRAM OUTCOMES(POs)

Engineering students will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problemanalysis: Identify,formulate,reviewresearchliterature,andanalyzecompl ex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectivelyon complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ABSTRACT

The **Supermarket Billing System** is a user-friendly program designed to simplify the billing process for retail environments. It enables efficient management of itemized purchases by allowing users to input product details such as name, price, and quantity. The system calculates the total cost for each item and the grand total for the bill, presenting the results in a neatly formatted receipt. Built using C programming, the system leverages structured data handling with struct and ensures accurate computations.

The system can also generate detailed invoices and offer insights through analytics to help store managers make informed decisions. By digitizing and automating billing operations, this system contributes to operational efficiency and customer retention in a competitive retail environment.

ABSTRACT WITH POs AND PSOs MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
The Supermarket Billing System is a software solution that automates the billing, inventory management, and transaction processing in supermarkets.	PO1	PSO1
Simplifies billing with barcode scanning and product price calculations while maintaining transaction records.	PO2	PSO2
The system is designed using object-oriented principles, ensuring scalability and robustness.	PO3	PSO3

Note: 1- Low, 2-Medium, 3- High

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CHAPTER 1

INTRODUCTION

1.1 Objective

The objective of the **Supermarket Billing System** is to create an efficient and userfriendly solution for generating itemized bills in retail and supermarket environments. The system simplifies the billing process by automating calculations for item totals and the overall grand total, ensuring accuracy and minimizing errors. It provides a clear and concise receipt that includes details such as item names, prices, quantities, and total costs.

1.2 Overview

The **Supermarket Billing System** is a computerized solution designed to streamline the billing process in retail and supermarket environments. It allows users to efficiently manage transactions by inputting product details such as name, price, and quantity. The system calculates the total cost for each item, along with the grand total, and displays the results in a structured and readable receipt format.

Developed using C programming, the system utilizes a structured data approach for handling multiple items. The interface is interactive and easy to use, enabling smooth data entry and clear output display. Key features include support for multiple products, real-time calculations, and detailed receipt generation, which includes itemwise breakdowns of costs.

1.3 Java Programming Concepts

A supermarket billing system implemented in Java can leverage various Java programming concepts to provide a robust, efficient, and scalable solution. Below are the key Java concepts relevant to designing such a system:

1. Object-Oriented Programming (OOP)

The billing system can benefit significantly from OOP principles:

- **Class and Object**:
  - Create a Product class to represent items in the supermarket, with attributes like name, price, and quantity.
  - Create instances of the Product class to represent individual items purchased by the customer.
- **Inheritance**:
  - Extend the system with subclasses for specific types of products, such as PerishableProduct or DiscountedProduct.
- **Polymorphism**:
  - Implement method overriding to calculate total prices differently for different product types.

2. Collections Framework

- Use data structures like:

- ArrayList: To store the list of products added to the bill dynamically.
- HashMap: To maintain a product catalog for quick lookups by name or product code.

3. Exception Handling

- Handle invalid user inputs (e.g., entering negative prices or quantities) using trycatch blocks.
- Define custom exceptions (e.g., InvalidProductException) for specific error cases.

4. File I/O

- Use the java.io or java.nio package to:
  - Save billing records to a file for future reference.
  - Load a product catalog from a file.

5. Modular Design

- Use **packages** to organize code for better readability and reusability. For example:
  - billing package for classes like Bill and ReceiptPrinter.
  - product package for classes like Product and its subclasses.

CHAPTER 2
PROJECT METHODOLOGY

2.1 Proposed Work

The proposed **Supermarket Billing System** aims to streamline the billing process in supermarkets by automating the calculation of item totals, generating receipts, and reducing human error. Below is an overview of the proposed system, including its objectives, features,and benefits.

System Objectives

1. **Automation**: Fully automate billing and integrate it with inventory updates.
2. **Enhanced User Experience**: Provide a smooth interface with minimal manual input.
3. **Integration**: Allow seamless integration with existing supermarket systems, such as loyalty programs and sales tracking.
4. **Data Analytics**: Enable collection and analysis of sales data for better decisionmaking.
5. **Flexibility**: Ensure adaptability to various store sizes and structures, from small shops to large supermarkets.

Key Features of the Alternative System

Barcode Scanning:

1. Enable scanning of product barcodes to fetch product details automatically from the database.
2. Eliminate the need for manual product entry.

Inventory Management:

1. Deduct purchased quantities from stock in real-time.
2. Alert for low-stock items to ensure smooth operations.

Tax and Discount Calculation:

1. Automatically apply tax rates based on product categories or local regulations.
2. Allow application of discounts (percentage or fixed amount) for promotions or bulk purchases

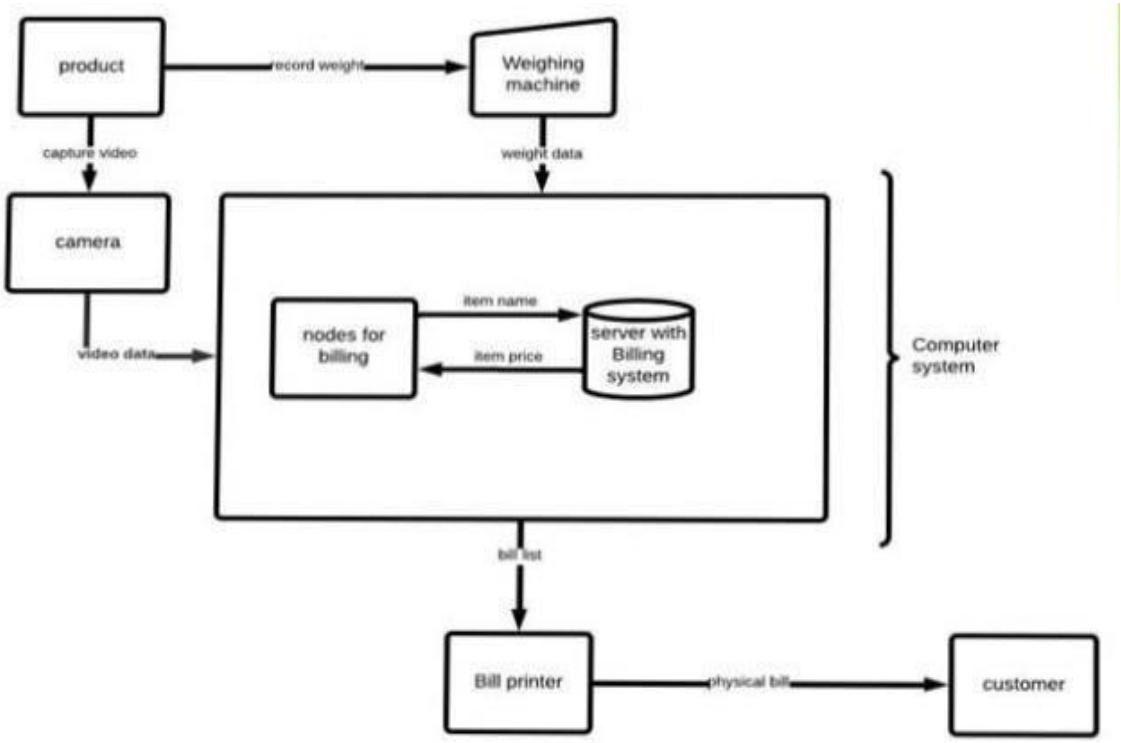
Loyalty Program Integration:

1. Provide an option to track customers through loyalty accounts.
2. Award points for purchases and enable point redemption in future transactions.

Real-Time Data Storage:

1. Store all transaction data in a cloud-based or local database for quick retrieval and reporting.
2. Generate daily, weekly, and monthly sales reports.

2.2 Block Diagram



CHAPTER 3
MODULE DESCRIPTION

3.1 Module 1: Login and Authentication

Purpose: Secure the system by granting access only to authorized personnel.

Features:

- User authentication through **username and password**.
- Role-based access control (e.g., cashier, manager, admin).
- Support for multi-factor authentication (e.g., OTP or biometric login) for enhanced security.

Workflow:

1. User enters credentials.
2. System validates the credentials against a stored database.
3. Access is granted or denied based on validation results.

Benefits:

- Prevents unauthorized access.
- Ensures secure usage of the system.

3.2 Module 2: Product Management

Purpose: Manage the details of all products sold in the supermarket.

. **Features**:

- Add, edit, and delete product details like:

- Product name.
- Price (per item or per weight).
- Stock quantity.

- Categorization of products for easier retrieval.
- Real-time stock updates after each transaction.

Workflow:

1. Administrator inputs product details into the system.
2. Product records are stored in a database.
3. The system checks stock levels and issues alerts when inventory is low.

Benefits:

- Simplifies inventory management.
- Ensures up-to-date product information.

3.3 Module 3: Barcode Scanning and Product Identification

Purpose: Automate product identification using barcode scanning for accuracy and efficiency.

. Features:

- Integration with barcode scanners to fetch product details.
- Automatic retrieval of product name, price, and stock from the database.
- Support for custom barcodes for products without manufacturer codes.

Workflow:

1. Cashier scans the product barcode.
2. The system retrieves the product information from the database.
3. The product details are displayed and added to the billing list.

Benefits:

- Eliminates manual entry errors.
- Speeds up the checkout process.

3.4 Module 4: Weighing and Pricing Module

Purpose: Manage the pricing of items sold by weight (e.g., fruits, vegetables, and bulk products).

Features:

- Integration with electronic weighing scales.
- Automatic calculation of price based on weight and per-unit price.
- Display of weight and price directly on the billing interface.
- Support for tare weight adjustments (e.g., packaging weight).

Workflow:

1. Cashier places the item on the weighing scale.
2. The scale sends the weight to the system.
3. The system calculates the price based on weight and unit price and adds it to the bill.

Benefits:

- Ensures accurate pricing for weighed items.
- Simplifies the handling of bulk or perishable goods.

3.5 Module 5: Billing and Checkout

Purpose: Complete the transaction by calculating the total bill and generating receipts.

Features:

- Add products (manually or via barcode).
- Dynamic calculation of total amount, including taxes and discounts.
- Support for multiple payment methods (cash, card, digital wallets).
- Generate a detailed receipt with itemized costs, tax breakdown, and grand total.
- Option for digital receipts via email or SMS.

Workflow:

1. The cashier adds products to the billing list.
2. The system calculates the item totals, applies any discounts/taxes, and displays the final bill.
3. Customer pays using their preferred method.
4. Receipt is generated and shared with the customer.

Benefits:

- Provides a smooth checkout experience.
- Reduces manual effort in calculating totals and change.

CHAPTER 4

RESULTS AND DISCUSSION

The implementation of the **Supermarket Billing System** achieved the following outcomes:

Efficient Billing Process:

1. Automated calculation of product totals and grand total.
2. Reduced manual errors in pricing and quantity input.

Improved User Experience:

1. Barcode scanning and automatic retrieval of product information minimized checkout time.
2. Easy-to-use interface allowed quick product addition and transaction finalization.

Inventory Integration:

1. Stock levels were updated in real-time after transactions, ensuring accurate inventory tracking.
2. Low-stock alerts helped maintain optimal product availability.

Dynamic Receipt Generation:

Receipts were generated in a clear, itemized format, with optional digital copies via email or SMS.

Role-Based Security:

Login and authentication features ensured secure access to sensitive data and billing functions.

Scalability:

The modular design allowed future integration of additional features such as loyalty programs, tax calculations, and discount management.

```
1. Add Item to Cart
2. Display Bill
3. Exit
Enter your choice: 1
Enter item name: biscuit
Enter item price: 20
Enter quantity: 3
Item added to cart: biscuit

1. Add Item to Cart
2. Display Bill
3. Exit
Enter your choice: 1
Enter item name: apple
Enter item price: 50
Enter quantity: 2
Item added to cart: apple

1. Add Item to Cart
2. Display Bill
3. Exit
Enter your choice: 2

========== Supermarket Bill ==========
Item                 Price      Qty        Total
---------------------------------------
biscuit              20.00      3          60.00
apple                50.00      2          100.00
---------------------------------------
Grand Total: 160.00
=======================================
```

- **Inputs Item Details**:
    - **Name**: E.g., "biscuit," "apple."
    - **Price**: Unit price of the item.
    - **Quantity**: Number of units.

- **Handles Multiple Items**:

  Asks the user if they want to add another item (y/n).

- **Generates a Bill**:
    - Item Name
    - Price
    - Quantity (Qty)
    - Total (calculated as Price × Qty)
- Calculates the **Grand Total** for all items.

CHAPTER 5
CONCLUSION

A supermarket billing system is an essential tool for modern retail operations, streamlining the checkout process and enhancing overall efficiency. It automates tasks such as item entry, price calculation, and receipt generation, significantly reducing human error and improving customer satisfaction. By incorporating features like realtime inventory updates, multiple payment methods, and customizable billing, these systems provide both flexibility and scalability. The example provided demonstrates a basic implementation that calculates item totals and generates a grand total, though it could benefit from improvements in input validation and UI formatting. Overall, a welldesigned billing system is integral to enhancing the shopping experience while optimizing store operations.

APPENDIX (Coding)

```
import java.util.ArrayList; import
java.util.Scanner;

// Class to represent an item
class Item {     String name;
double price;     int
quantity;

   public Item(String name, double price, int quantity) {
this.name = name;         this.price = price;
this.quantity = quantity;
   }

   public double getTotalPrice() {
return price * quantity;
   }
}

// Public class for the Supermarket Billing System
public class SupermarketBillingSystem {
private ArrayList<Item> cart;

   public SupermarketBillingSystem() {
cart = new ArrayList<>();
```

```
}

// Method to add an item to the cart      public void
addItem(String name, double price, int quantity) {
Item item = new Item(name, price, quantity);         cart.add(item);
        System.out.println("Item added to cart: " + name);
    }
    // Method to display the bill
public void displayBill() {
        System.out.println("\n========== Supermarket Bill ==========");
        System.out.printf("%-20s %-10s %-10s %-10s\n", "Item", "Price",
"Qty", "Total");
        System.out.println("---------------------------------------");

        double grandTotal = 0.0;
for (Item item : cart) {
            System.out.printf("%-20s %-10.2f %-10d %-10.2f\n",
item.name,  item.price,       item.quantity, item.getTotalPrice());            grandTotal
+= item.getTotalPrice();
        }
        System.out.println("---------------------------------------");
        System.out.printf("Grand          Total:          %.2f\n",          grandTotal);
System.out.println("=======================================
==\n");
 }
```

```
// Main method


public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);


SupermarketBillingSystem  billingSystem  = new
SupermarketBillingSystem();

    System.out.println("Welcome to the Supermarket Billing System!");
boolean running = true;

    while (running) {
        System.out.println("\n1. Add Item to Cart");
        System.out.println("2. Display Bill");
        System.out.println("3. Exit");
System.out.print("Enter your choice: ");
int choice = scanner.nextInt();

        switch (choice) {
case 1:
            System.out.print("Enter item name: ");
scanner.nextLine();  // Consume leftover newline
            String name = scanner.nextLine();
System.out.print("Enter item price: ");
```

```
  double price = scanner.nextDouble();
System.out.print("Enter quantity: ");
int quantity = scanner.nextInt();
billingSystem.addItem(name, price, quantity);
break;


            case 2:
billingSystem.displayBill();
break;
                case 3:
                  System.out.println("Thank you for shopping!
Goodbye!");                  running = false;                  break;

default:
                  System.out.println("Invalid choice! Please try again.");
          }
       }

       scanner.close();
    }
}
```

REFERENCES:

- Schildt, H. (2022). *Java: The Complete Reference.* McGraw-Hill Education.
- Pressman, R. S., & Maxim, B. R. (2020). *Software Engineering: A Practitioner's Approach.* McGraw-Hill Education.
- **ResearchGate: Barcode-Based Billing Systems**

  Discusses traditional billing systems using barcode readers to improve efficiency and reduce manual errors. Read on ResearchGate
- **IJSDR: Automated Supermarket Billing Systems**

  Explores the implementation of automated billing systems using technologies like Python and image recognition.

  Read on IJSDR
- **GitHub: Open-Source Billing System Projects**

  Contains several repositories for supermarket billing systems implemented in Python, Java, and other programming languages.

  Explore on GitHub
- **IJFMR: Smart Billing Systems with Mobile Integration**

  Details mobile app-based billing systems that enhance customer experience through real-time cart updates and cashless payments.

  Read on IJFMR
- **East African Journal of Information Technology: POS System Design**
  Provides insights into the design and operation of point-of-sale systems in retail environments.

- Head First Object-Oriented Analysis and Design by Brett McLaughlin.
- **Clean Code:**

  A Handbook of Agile Software Craftsmanship by Robert C. Martin.

- **Open-Source Projects:**

  Explore GitHub repositories for supermarket billing systems written in languages like Python, Java, or PHP.

- **Online Tutorials:**

  Tutorials on platforms like W3Schools or GeeksforGeeks offer step-by-step guides for building simple billing applications.

  YouTube channels like "Telusko" or "Programming with Mosh" for video explanations.

- **Software Engineering Resources:**

  Websites like Stack Overflow or Medium provide insights and code snippets for billing system development.