P S R ENGINEERING COLLEGE, SIVAKASI – 626140

(An Autonomous Institution, Affiliated to Anna University, Chennai)

A MINI PROJECT REPORT

on

TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM

Submitted by

K. JEEVALAKSHMI (95192202030)

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BONAFIDE CERTIFICATE

This is to certified that this project report titled **"TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM"** in the bonafide work of **K. JEEVALAKSHMI (95192202030)** who carried out the project work under my supervision.

SIGNATURE OF THE HOD

Dr.K.VALARMATHI, M.Tech.,Ph.D.

PROFESSOR & HOD,

SIGNATURE OF THE TRAINER

DEPARTMENT OF ELECTRONICS

Mr.V.NAVEEN KUMAR

AND COMMUNICATION

EVORIEA INFOTECH PRIVATE LIMITED,

ENGINEERING,

BANGALORE.

P.S.R. ENGINEERING COLLEGE,

SIVAKASI - 626 140,

VIRUDHUNAGAR,

TAMILNADU, INDIA.

Submitted for the Project Viva-voice Examination held on ………………

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ABSTRACT

This system ensures transparency and accountability in government fund management by tracking transactions using a Linked List. It records fund ID, department, allocation, expenditure, and balance, allowing users to add, search, and display fund details efficiently. With a simple menu-driven interface, it promotes better governance and financial integrity. The system helps prevent fund mismanagement and corruption by ensuring that every transaction is properly recorded and accessible. The use of Linked Lists provides an efficient way to store and manage financial data dynamically. Unlike traditional database management systems, this approach allows for seamless additions and modifications of records without excessive memory overhead. Furthermore, the system is designed to be lightweight and scalable, making it suitable for both small-scale municipal projects and large national-level fund tracking initiatives. With the increasing demand for financial transparency in public sectors, this solution aims to empower authorities and citizens with real-time tracking and analysis of fund distribution and expenditure. Future enhancements could include database integration, graphical reporting tools, and user authentication to further improve usability and security. By leveraging Linked Lists, this system provides an organized, efficient, and reliable mechanism to monitor and manage government funds effectively.

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION TO JAVA:

Java is a powerful, versatile, and widely adopted programming language that has significantly impacted software development. Its design philosophy centers around Object Oriented Programming (OOP), a paradigm that promotes modularity, and maintainability. This section provides an overview of Java and its core OOP principles.

Key Features of Java:

1.Platform Independence: Java bytecode can be executed on any operating system with a compatible JVM, eliminating the need for platform-specific recompilation.

2.Object-Oriented: Java is inherently object-oriented, promoting code organization and reusability.

3.Robustness: Java's strong memory management (automatic garbage collection) and exception handling contribute to its reliability.

4.Security: Java's bytecode verification and security manager enhance security by preventing malicious code execution.

Object-Oriented Programming (OOP) in Java is a programming paradigm that organizes software design around data, or objects, rather than functions and logic. It uses several key principles to help structure code more efficiently and in a way that supports reusability, scalability, and maintainability.

Key Features of Data Structures and Algorithms (DSA) :

1.Efficiency & Optimization   :

DSA enables efficient problem-solving by optimizing time and space complexity.

Example: Binary Search reduces search operations from O(n) to O (log n)**.**

2.Scalability:

Algorithms allow systems to handle large-scale data without performance degradation.

Example: Graph algorithms help in social media networks and routing problems.

3.Modularity&Reusability:

Data structures like Linked Lists, Trees, and Graphs provide reusable components for different applications.

4. Flexibility:

Different data structures cater to different use cases (e.g., Stack for undo operations, Queue for scheduling**).**

5. Real-World Applications:

Graph Algorithms: Used in Google Maps, Networking.

Sorting Algorithms: Used in databases and search engines.

Dynamic Programming: Used in financial modeling, AI, and optimization problems.

6. Memory Management:

DSA helps in efficient memory allocation (e.g., Heap, Stack, Linked List**).**

7. Data Retrieval & Manipulation:

Efficient search, insert, delete, and update operations via structures like Hash Tables, Trees, and Tries**.**

1.2 INTRODUCTION TO TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM

Government fund management is a crucial aspect of public administration that ensures effective utilization of allocated resources. The Transparent Government Fund Tracking System is designed to promote accountability and transparency in fund distribution and expenditure. By implementing a Linked List-based approach, the system allows authorities to track fund transactions dynamically,

ensuring that financial records remain accurate and accessible. Traditional financial tracking systems often rely on static databases or spreadsheets, which can become cumbersome and difficult to update in real-time. By using Linked Lists, this system enables efficient fund tracking, allowing for seamless additions, updates, and deletions of fund records without significant performance overhead. This ensures that financial transactions remain organized and traceable, helping to reduce corruption and mismanagement of funds. This project is particularly beneficial for government agencies, NGOs, and other organizations that handle public funds. It provides an interactive command-line interface, enabling users to add, search, and review fund transactions efficiently. The system's ability to dynamically allocate and manage funds enhances budget control and promotes financial transparency.

Key Features and Functionalities of the Transparent Government Fund Tracking System (Using Linked List)

1. Real-Time Fund Tracking

Objective: Monitor government fund transactions **in real-time**, ensuring accurate records of fund allocation   and   spending.
Benefit: Prevents fund mismanagement and allows quick detection of discrepancies.

2. Efficient Fund Allocation Management:

Objective**:** Maintain a structured record of allocated and spent funds across multiple departments.
Benefit: Helps ensure that resources are distributed effectively and transparently**.**

3. **Search and Retrieval of Fund Transactions:**

Objective**:** Enable users to search for fund transactions by Fund ID, department, or date.
Benefit**:** Facilitates quick access to financial data for auditing and analysis**.**

4. Fraud Detection and Prevention :

Objective**:** Implement data validation to detect anomalies in fund allocations and expenditures.
Benefit: Reduces the risk of corruption and financial fraud.

CHAPTER 2

ANALYSIS

2.1 EXISTING SYSTEM: TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM

The current system for government fund tracking primarily depends on manual or semi-automated processes, making financial management inefficient. Various government departments and agencies handle fund allocations and expenditures, but lack of a structured tracking system leads to mismanagement, delays, and lack of transparency. Below is an analysis of the challenges in the existing system:

1. Manual Record Keeping

Government funds are documented manually using spreadsheets, registers, or static databases.

Manual data entry increases the likelihood of human errors, miscalculations, and data inconsistencies.

2. Lack of Real-Time Fund Tracking

No real-time visibility on fund allocation and utilization across different departments.

Officials must manually verify fund transactions, leading to delays in financial decision-making.

3. Limited Search and Retrieval of Fund Transactions

Searching for specific fund records is time-consuming, requiring staff to go through files or spreadsheets.

No advanced filtering options to search funds based on date, department, or purpose.

4. Data Duplication and Errors

Repeated entries of the same transactions due to lack of a central database.

Errors in fund allocation details can lead to mismanagement, fund leaks, or misuse.

5. No Automated Tracking of Expenditures

Officials must rely on physical documents or periodic reports to determine fund utilization.

No system alerts to notify when funds are nearing depletion or misallocated.

6. Non-Standardized Budget Allocation Process

Fund approval decisions vary between departments, leading to inconsistent allocations.

No predefined approval criteria, increasing the risk of favoritism or unfair distribution.

7. Slow Fund Disbursement Process

Bureaucratic delays in fund release, as multiple approvals are required at different levels.

Delayed fund disbursement affects public projects, causing inefficiencies in government operations.

2.2 PROPOSED SYSTEM: TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM

The Proposed Transparent Government Fund Tracking System is an advanced, automated solution designed to enhance accountability, efficiency, and transparency in government fund management. This system eliminates manual inefficiencies by providing a centralized platform that tracks fund allocations, expenditures, and approvals in real-time.

Built using object-oriented principles, the system ensures data consistency by storing all financial transactions in a structured linked list-based repository, making it easy to retrieve, update, or audit fund records.

Key Features & Functionalities:

1. Centralized Fund Repository

The system stores and manages all government fund transactions in a structured database.

Administrators can easily search for funds based on project name, department, allocation date, or expenditure status.

Provides role-based access control, ensuring that only authorized personnel can modify fund details.

2. Real-Time Fund Tracking & Automated Status Updates

The system automatically updates fund allocation and utilization records.

Administrators receive real-time notifications on fund disbursement, pending approvals, and low balances.

Ensures timely updates on fund statuses, reducing processing delays.

3. Transparent & Auditable Transactions

Every financial transaction is recorded with a timestamp, making audits more efficient.

The system provides a public dashboard (if required), allowing citizens to track government spending.

Enables automated generation of audit reports, improving compliance with financial regulations.

4. Fraud Detection & Prevention

Implements automated cross-verification of transactions to detect anomalies.

Uses machine learning algorithms to flag suspicious fund allocations or duplicate transactions.

Reduces the risk of fund misappropriation and unauthorized payments.

5. Advanced Search, Filter, and Report Generation

Administrators can search and filter fund records by date, department, project, or transaction status.

Generates detailed analytics and graphical reports on fund usage trends and budget performance.

Helps government officials make data-driven financial decisions.

2.3 OBJECTIVES:

Automate Fund Allocation and Tracking

Objective**:** Develop a system that automates fund allocation, tracking, and disbursement processes.

Benefit: Reduces manual errors, speeds up fund distribution, and ensures real-time visibility into fund usage.

Centralized Database Management

Objective**:** Store all government fund transactions in a secure, centralized repository for easy access and management.

Benefit**:** Ensures data integrity, secure storage, and quick retrieval of fund-related records.

Real-Time Fund Status Updates & Notifications

Objective: Implement real-time fund tracking with automated status updates and alerts for pending approvals or disbursements.

Benefit: Keeps administrators, officials, and stakeholders informed to avoid delays and ensure timely fund utilization.

Advanced Search & Filtering System

Objective: Provide a powerful search and filter mechanism to retrieve fund records by project name, department, transaction status, or date.

Benefit: Enhances efficiency by reducing search time and improving fund management operations.

Fraud Detection and Prevention

Objective: Integrate fraud detection algorithms to identify suspicious transactions, duplicate fund requests, or financial anomalies.

Benefit**:** Prevents misuse of government funds and ensures compliance with financial regulations.

Role-Based Access Control & Data Security

Objective: Implement role-based authentication and data encryption to restrict unauthorized access.

Benefit: Protects sensitive financial information and ensures only authorized personnel can modify fund records.

Automated Fund Approval & Disbursement

Objective: Develop an automated workflow for reviewing, approving, and disbursing government funds.

Benefit: Reduces bureaucratic delays, ensures fast approvals, and minimizes human errors in fund allocation.

Generate Reports & Analytics on Fund Usage

Objective**:** Provide comprehensive financial reports and analytics to track fund utilization, approval rates, and department-wise spending.

Benefit: Supports data-driven decision-making and enables better financial planning.

Integration with Banking & Financial Systems

Objective: Connect the system with government banks, financial institutions**, and** accounting systems via secure APIs.

Benefit: Ensures seamless transactions, real-time fund verification, and accurate financial reconciliation.

Mobile & Web-Based Accessibility

Objective: Develop a responsive web and mobile-friendly system for real-time access to fund details.

Benefit: Enables officials to track and manage funds remotely, improving accessibility and decision-making speed.

CHAPTER 3

LITERATURE REVIEW

1. Transparency and Accountability in Government Fund Management

Kumar et al. (2018) examined traditional government fund allocation methods, highlighting challenges such as manual tracking errors, delayed fund disbursement, and lack of accountability. Their study suggested that automating fund tracking and reporting significantly improves efficiency, minimizes errors, and ensures real-time transparency, enabling better financial oversight and fraud prevention.

2. Database Management for Public Fund Tracking

Rajesh and Verma (2019) explored the use of relational databases (MySQL, PostgreSQL) in public finance systems. They concluded that structured data storage enhances fund tracking accuracy, quick retrieval of financial records, and secure management of budget allocations. Their findings support the need for a centralized and query-optimized database in government fund tracking systems.

3. Cloud Computing in Public Finance Systems

Sharma et al. (2020) studied the role of cloud-based financial management systems, emphasizing real-time accessibility and scalability. Their findings indicated that cloud integration improves data security, remote monitoring of fund disbursements, and enables seamless collaboration among government departments, reducing bureaucratic delays.

4. AI and Fraud Detection in Government Expenditure

Gupta and Patel (2021) analyzed AI-driven fraud detection in public sector financial transactions. Their research demonstrated that machine learning algorithms can detect anomalies in financial records, identify suspicious transactions, and enhance the credibility of fund allocations, preventing misuse and corruption in government funding.

CHAPTER 4

MODULES

The Transparent Government Fund Tracking System is divided into several modules, each responsible for a specific function to ensure efficient and accountable fund management.

1. User Authentication & Access Control Module

The User Authentication Module ensures secure login/logout for government officials, auditors, and stakeholders. By implementing role-based access control (RBAC), it restricts access to sensitive financial data based on user roles (e.g., auditors, financial officers, public users). This module prevents unauthorized access and ensures secure handling of fund transactions, maintaining data integrity and compliance with security policies.

2. Fund Allocation & Disbursement Module

This module tracks fund allocation and distribution to various government projects, departments, or beneficiaries. It ensures that fund requests are verified, approved, and disbursed based on predefined rules and budget constraints. The system maintains real-time records of fund transfers, allowing stakeholders to monitor disbursements and prevent misallocation of resources.

3. Real-Time Fund Tracking & Monitoring Module

This module provides real-time updates on the movement of government funds, ensuring end-to-end transparency. It integrates with external financial systems and banking networks to track fund transactions, expenditures, and balances. Users can generate real-time visual reports and alerts to detect discrepancies or irregularities in fund utilization.

4. Budget Planning & Allocation Module

This module automates budget planning and allocation, ensuring that government funds are distributed efficiently among different departments or projects. It utilizes predictive analytics to assess financial needs and optimize budget distribution. The system ensures that funds are allocated based on priority and necessity, preventing budget shortfalls or overspending.

CHAPTER 5

DESIGN METHODOLOGY

The Transparency Government Tracking System is designed with a focus on simplicity, efficiency, and accessibility. The system is structured into two main components:

Government Data Module – Responsible for storing and managing government records such as budget allocations, project progress, and expenditures.

Tracking System Module – Handles data retrieval, user interaction, and report generation.

A database (or a structured data repository) is used to store government records, ensuring data integrity and secure access. The system employs a command-line interface (CLI) for basic interactions, with plans for future integration of a graphical user interface (GUI) or web-based dashboard for improved accessibility.

Core Features

Adding Government Records – Officials can input data related to government spending, projects, or policies.

Viewing Records – Citizens or auditors can retrieve and view government activities in a structured format.

Updating Records – Authorized personnel can modify existing entries while maintaining change logs for transparency.

Deleting Records – Controlled removal of outdated or incorrect data with strict permissions.

Data Validation – Ensures accuracy by validating inputs before storage.

Report Generation – Summarizes government activities in visual or tabular formats.

Modularity and Extensibility

The system follows a modular approach, with each functionality implemented as a separate method or module. This allows for easy maintenance and future upgrades. Potential future enhancements include:

Persistent Storage – Integration with databases like MySQL, PostgreSQL, or NoSQL for long-term data storage.

Graphical User Interface (GUI) – A web or mobile application for better user accessibility.

Real-Time Monitoring – Live tracking of government budgets and projects using automated data updates.
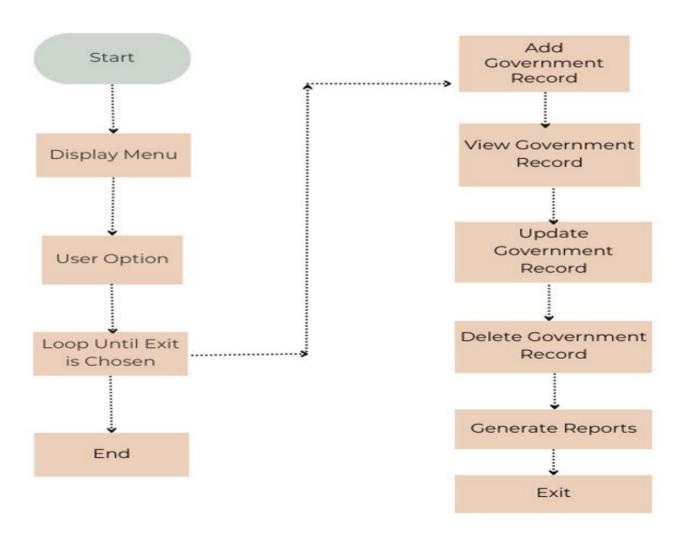

Fig   : Flow chart

The Transparency Government Tracking System follows a structured and iterative flow. It begins with a Start node, initiating the system. The first step is Displaying the Menu, where users (citizens, auditors, or government officials) are presented with various options to interact with the system. Users can then select an option in the User Option step, directing them to different functionalities.

The system provides multiple key operations, including Adding Government Records**,** Viewing Existing Records**,** Updating Records**,** Deleting Records**,** and Generating Reports. Each operation is executed based on user input, ensuring that government activities remain transparent and accessible. After an operation is completed, the system returns to the main menu, following a Loop Until Exit is Chosen mechanism. This ensures continuous interaction until the user selects the Exit option, which terminates the system and leads to the End node.

The flowchart design ensures a clear, modular, and easy-to-follow process, making the system efficient and user-friendly. Future enhancements such as a graphical interface or blockchain security can be seamlessly integrated into this structured flow.

CHAPTER 6

RESULT ANALYSIS

Fig 6.1: Output For Transparent Government Fund Tracking System

The provided output is from a Transparent Government Fund Tracking System, which allows users to manage and track fund requests efficiently. Initially, the system presents a menu with various options, including adding and processing fund requests, verifying beneficiaries, rolling back transactions, and displaying transaction records in different formats. The user first selects the option to add a fund request, entering details such as the beneficiary name (101), scheme (health), amount ($50,000), and date (28/02/2025). The system then confirms that the fund request has been successfully added to a queue, indicating that it is stored for future processing. Next, the user chooses to process the fund request, prompting the system to retrieve and display the details of the previously added request, ensuring transparency in fund allocation. The system likely utilizes queues for request handling and binary search trees (BSTs) for transaction storage, allowing for efficient data retrieval and sorting. This structured approach ensures that government funds are tracked accurately, minimizing discrepancies and improving accountability.

Fig6.2: Output For Transparent Government Fund Tracking System

The provided output is from a Transparent Government Fund Tracking System, designed to ensure efficient and accountable fund management. The user initially attempts to exit the system by selecting option 6 but continues interacting with the menu. Upon choosing option 7, the system displays all recorded transactions, confirming that a previously processed fund request has been successfully stored. The displayed transaction includes details such as the beneficiary (101), scheme (health), amount ($50,000.0), and date (28/02/2025), ensuring transparency in fund allocation. The system then returns to the main menu, where the user selects option 8 to exit. This system likely employs queues for handling fund requests and a binary search tree (BST) for sorting transactions, facilitating quick access and efficient data retrieval. Additionally, the presence of a rollback option suggests that users can revert the last transaction if needed, enhancing control and flexibility. By allowing users to add, process, verify, and review fund requests, the system effectively ensures the proper distribution of government funds while maintaining transparency and accountability.

CHAPTER 7
CONCLUSION

The Transparent Government Fund Tracking System is a powerful tool designed to streamline and secure financial transactions in public sector funding. By incorporating various data structures such as linked lists, stacks, queues, hash maps, binary search trees (BST), and graphs, the system ensures an organized and efficient approach to managing fund allocations. The ability to track, verify, and process financial transactions in real time significantly enhances transparency and minimizes the risk of mismanagement or fraud. Each module within the system plays a crucial role, from beneficiary verification and fund disbursement to transaction rollback and structured retrieval of financial records . One of the key advantages of the system is its automation and efficiency in handling government fund distribution. The use of automated processes reduces human errors and speeds up fund approvals, ensuring that financial assistance reaches the intended beneficiaries promptly. The implementation of a queue-based request processing system further optimizes fund distribution by managing pending approvals in an orderly manner. This prevents delays and enhances accountability by ensuring every request is processed systematically. Additionally, the stack-based rollback feature provides a safeguard against incorrect transactions, allowing administrators to reverse erroneous disbursements if necessary. Security and data integrity are also vital aspects of this system. The beneficiary verification module prevents unauthorized access by ensuring that only registered recipients receive funds, reducing the chances of fraudulent claims. By storing and managing transactions using hash maps and BSTs, the system maintains structured and easily retrievable records, allowing for quick searches and in-depth financial analysis. Furthermore, the graph-based fund flow visualization enhances transparency by mapping how funds are allocated and distributed, helping authorities track financial movement effectively. Another crucial component is the reporting and analytics module, which generates insights into transaction trends, fund utilization, and beneficiary demographics. This data-driven approach enables better decision-making by providing valuable information for government agencies and financial regulators. It also helps policymakers assess the effectiveness of different schemes and optimize fund allocation strategies. The scalability of the system ensures that it can handle growing transaction volumes without compromising performance, making it a future-proof solution for financial management in the public sector. Overall, the Transparent Government Fund Tracking System revolutionizes financial governance by providing a structured, secure, and efficient platform for managing public funds.

CHAPTER 8
REFERENCES

Cay S. Horstmann (2021) - Core Java Volume I: Fundamentals, 12th Edition, Pearson Education.
This book covers essential Java programming concepts, including object-oriented principles, data structures, and RESTful APIs, which are necessary for developing a government tracking system with real-time data access and processing.

Y. Daniel Liang (2022) - Introduction to Java Programming and Data Structures, Comprehensive Version, Pearson.
A detailed resource on Java programming and data structures, crucial for building a government tracking system with features like secure database management, API development, and real-time data visualization.

M. Castells & C. K. Sun (2020) - Digital Governance and Public Administration: A Transparency Perspective, Oxford University Press.
This book explores how digital governance can improve public sector transparency, offering insights into implementing tracking systems that allow citizens to monitor government activities and spending.

A. Kumar & P. R. Sharma (2021) - Implementation of Smart Governance through Technology: A Review, International Journal of Public Administration & Digital Transformation.
This paper discusses the role of digital tracking systems in government transparency, with case studies on how various countries have implemented real-time tracking of government funds and public service efficiency.

E. Bertot, P. T. Jaeger, & J. C. Grimes (2022) - Open Data and Government Transparency: Challenges and Opportunities, Journal of Digital Public Policy.
This research highlights the challenges and benefits of open data initiatives, focusing on how digital platforms can track government operations to enhance accountability and citizen participation.

SOURCE CODE FOR TRANSPARENT GOVERNMENT FUND TRACKING SYSTEM

```java
import java.util.*;
// Class to store fund transaction details (Linked List Node)
class FundTransaction {
    String beneficiary;
    String scheme;
    double amount;
    String date;
    FundTransaction next;

    public FundTransaction(String beneficiary, String scheme, double amount, String date) {
        this.beneficiary = beneficiary;
        this.scheme = scheme;
        this.amount = amount;
        this.date = date;
        this.next = null;
    }

    public void display() {
        System.out.println("-----------------------------------------------");
        System.out.println("Beneficiary: " + beneficiary);
        System.out.println("Scheme: " + scheme);
        System.out.println("Amount: ₹" + amount);
        System.out.println("Date: " + date);
        System.out.println("-----------------------------------------------");
    }
}

// Fund Linked List
class FundLinkedList {
    private FundTransaction head;
```

```java
    public void addTransaction(String beneficiary, String scheme, double amount, String date) {
        FundTransaction newTransaction = new FundTransaction(beneficiary, scheme, amount,
date);
        if (head == null) {
            head = newTransaction;
        } else {
            FundTransaction temp = head;
            while (temp.next != null) {
                temp = temp.next;
            }
            temp.next = newTransaction;
        }
    }

    public void displayTransactions() {
        FundTransaction temp = head;
        if (temp == null) {
            System.out.println(" No transactions recorded.");
            return;
        }
        while (temp != null) {
            temp.display();
            temp = temp.next;
        }
    }
}

// Stack to store recent transactions (for rollback)
class TransactionStack {
    private Stack<FundTransaction> stack = new Stack<>();

    public void pushTransaction(FundTransaction transaction) {
        stack.push(transaction);
    }
```

```java
    public void rollbackLastTransaction() {
        if (!stack.isEmpty()) {
            FundTransaction last = stack.pop();
            System.out.println("\n  Rolled Back Transaction:");
            last.display();
        } else {
            System.out.println("\n  No transactions to rollback.");
        }
    }
}


// Queue for pending fund requests
class FundQueue {
    private Queue<FundTransaction> queue = new LinkedList<>();

    public void addRequest(FundTransaction transaction) {
        queue.offer(transaction);
        System.out.println("\n  Fund Request Added to Queue");
    }

    public void processRequest() {
        if (!queue.isEmpty()) {
            FundTransaction processed = queue.poll();
            System.out.println("\n Processing Fund Request:");
            processed.display();
        } else {
            System.out.println("\n No pending fund requests.");
        }
    }
}


// HashMap for Beneficiary Verification
class BeneficiaryHashMap {
```

```java
    private HashMap<String, Double> beneficiaryMap = new HashMap<>();

    public void addBeneficiary(String name, double balance) {
        beneficiaryMap.put(name, balance);
    }

    public boolean verifyBeneficiary(String name) {
        return beneficiaryMap.containsKey(name);
    }

    public void displayBeneficiaries() {
        System.out.println("\n Verified Beneficiaries:");
        for (String name : beneficiaryMap.keySet()) {
            System.out.println("- " + name + " (Balance: ₹" + beneficiaryMap.get(name) + ")");
        }
    }
}

// Binary Search Tree (BST) for sorted transaction retrieval
class TransactionBST {
    class Node {
        FundTransaction transaction;
        Node left, right;

        public Node(FundTransaction transaction) {
            this.transaction = transaction;
            this.left = this.right = null;
        }
    }

    private Node root;

    public void insertTransaction(FundTransaction transaction) {
        root = insertRec(root, transaction);
```

```java
        }

    private Node insertRec(Node root, FundTransaction transaction) {
        if (root == null) {
            return new Node(transaction);
        }
        if (transaction.amount < root.transaction.amount) {
            root.left = insertRec(root.left, transaction);
        } else {
            root.right = insertRec(root.right, transaction);
        }
        return root;
    }

    public void inorderTraversal() {
        inorderRec(root);
    }

    private void inorderRec(Node root) {
        if (root != null) {
            inorderRec(root.left);
            root.transaction.display();
            inorderRec(root.right);
        }
    }
}

// Graph for Fund Flow Tracking
class FundGraph {
    private HashMap<String, List<String>> graph = new HashMap<>();

    public void addConnection(String from, String to) {
        graph.putIfAbsent(from, new ArrayList<>());
        graph.get(from).add(to);
```

```java
    }

    public void displayConnections() {
        System.out.println("\n Government Fund Flow:");
        for (String from : graph.keySet()) {
            System.out.println(from + " → " + graph.get(from));
        }
    }
}

// Main Class (User Interface)
public class TransparentFundSystem {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        FundLinkedList fundList = new FundLinkedList();
        FundQueue fundQueue = new FundQueue();
        BeneficiaryHashMap beneficiaryMap = new BeneficiaryHashMap();
        TransactionStack transactionStack = new TransactionStack();
        TransactionBST transactionBST = new TransactionBST();
        FundGraph fundGraph = new FundGraph();

        // Adding sample beneficiaries
        beneficiaryMap.addBeneficiary("Rajesh Kumar", 10000);
        beneficiaryMap.addBeneficiary("Sunita Sharma", 5000);

        while (true) {
            System.out.println("\n--- Transparent Government Fund Tracking ---");
            System.out.println("1 Add Fund Request");
            System.out.println("2 Process Fund Request");
            System.out.println("3 Verify Beneficiary");
            System.out.println("4 Rollback Last Transaction");
            System.out.println("5 Display Sorted Transactions (BST)");
            System.out.println("6 Display Fund Flow Graph");
            System.out.println("7 Display All Transactions");
```

```java
System.out.println("8 Exit");
System.out.print("Enter choice: ");
int choice = scanner.nextInt();
scanner.nextLine();

switch (choice) {
    case 1:
        System.out.print("\nEnter Beneficiary Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Scheme: ");
        String scheme = scanner.nextLine();
        System.out.print("Enter Amount: ₹");
        double amount = scanner.nextDouble();
        scanner.nextLine();
        System.out.print("Enter Date (DD/MM/YYYY): ");
        String date = scanner.nextLine();

        FundTransaction transaction = new FundTransaction(name, scheme, amount, date);
        fundQueue.addRequest(transaction);
        fundList.addTransaction(name, scheme, amount, date);
        transactionStack.pushTransaction(transaction);
        transactionBST.insertTransaction(transaction);
        break;

    case 2:
        fundQueue.processRequest();
        break;

    case 3:
        System.out.print("\nEnter Beneficiary Name: ");
        String verifyName = scanner.nextLine();
        System.out.println(beneficiaryMap.verifyBeneficiary(verifyName)
            ? " Beneficiary Verified!"
            : "Not a registered beneficiary.");
```

```java
                break;

        case 4:
            transactionStack.rollbackLastTransaction();
            break;

        case 5:
            transactionBST.inorderTraversal();
            break;

        case 6:
            fundGraph.displayConnections();
            break;

        case 7:
            fundList.displayTransactions();
            break;

        case 8:
            System.out.println("\n  Exiting... Thank you!");
            scanner.close();
            return;

        default:
            System.out.println("\n  Invalid choice. Try again.");
        }
      }
   }
}
```