

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**INNOVATIVE ASSIGNMENTS**

**ACADEMIC YEAR: 2023-2024 SEM-I**

**OBJECT-ORIENTED PROGRAMMING THROUGH JAVA II YEAR I SEM**

1.**Implement** a secure online voting system using Java with user authentication, vote encryption, and result tabulation. Ensure to follow security best practices in your implementation.

**Goal:** Emphasize real-world security considerations, file handling, and algorithm implementation. **(CO5)**

2.**Create** and **implement** a Java-based personal finance manager. **Analyze** spending patterns using custom algorithms and design a dashboard for users to visualize their expenses.

**Tasks Breakdown:**

* **Create**: Define core classes for transactions, categories, and reports.
* **Implement**: Build the backend logic using Java Collections and File I/O.
* **Analyze**: Generate monthly spending reports and evaluate category-wise expenditures.
* **Design**: Design a modular class structure and simple CLI or GUI interface. **(CO5)**

**DATABASE MANAGEMENT SYSTEMS II YEAR I SEM**

1.**Task:**  
Analyze the query performance of a database system under varying loads (small vs. large datasets). Use SQL EXPLAIN or equivalent tools to compare query plans before and after adding appropriate indexes.

**Challenge:**  
Present a detailed report on how indexing strategies impacted query execution time and resource usage, highlighting potential bottlenecks. **(CO5)**

2. **Task:**  
Create a relational database model for a futuristic smart city that integrates public transport, energy management, healthcare, and security data. Include at least 10 tables covering different functional areas and establish meaningful relationships using foreign keys.

**Challenge:**  
Incorporate complex data types like JSON columns (if using PostgreSQL or MySQL 8.0+). **Justify** your choice of data types. **(CO3)**

**FORMAL LANGUAGES AND AUTOMATA THEORY** **III YEAR I SEM**

1. **Implement a simulator** for a Turing Machine that can parse and execute user-defined transition tables. Include visual trace steps. **(CO5)**
2. **Devise a context-free grammar** that generates the syntax of a mini programming language (including loops, if-else, and variable declarations). Ensure it’s unambiguous and justify the grammar structure. **(CO3)**

**PRINCIPLES OF PROGRAMMING LANGUAGES III YEAR I SEM**

1. **"Create** a new mini-language for domain-specific tasks (e.g., text processing, scientific computation, or data visualization). **Define** its syntax, key semantic rules, and propose possible applications."

*Focus:* Syntax design, semantics understanding, creativity in language construction. **(CO1)**

2. **"Implement** a simple interpreter for a stack-based toy programming language supporting arithmetic operations, loops, and conditional branching. Provide sample programs and explain your implementation decisions."

*Focus:* Interpreter design, implementation skills, basic language processing. **(CO2)**

**INTERNET OF THINGS IV YEAR I SEM**

1. **Design an IoT-based traffic management system** that uses real-time data from road sensors, cameras, and vehicle telemetry to optimize traffic flow in urban areas. **(CO5)**

2. **Create a context-aware IoT application** that learns user habits over time (e.g., smart kitchen assistant or personal health monitor). Include AI/machine learning aspects. **(CO5)**

**SOFTWARE TESTING METHODOLOGIES IV YEAR I SEM**

**1. Implement a test data generation tool** that uses pairwise testing or combinatorial techniques to reduce the number of test cases while maintaining coverage. **(CO4)**

2. **Design an effective test case suite** using decision table and boundary value analysis for a complex insurance claim processing module. **(CO3)**

**OBJECT ORIENTED MODELING DESIGN IV YEAR I SEM**

1. **Design an object-oriented model** for an online examination system with roles like admin, examiner, candidate, and question bank. Include relationships and dynamic behavior. **(CO2)**
2. **Analyze a real-world system (e.g., ATM, Library Management, Online Banking)** and critique its object-oriented design with respect to maintainability, scalability, and flexibility. **(CO2)**

**DATA MINING IV YEAR I SEM**

1. **How** do you work with data mining algorithms included in the SQL server data mining.**(CO2)**
2. **What** characterizes a machine learning-based approach to data mining?**(CO2)**

**INFORMATION SECURITY AND RISK MANAGEMENT IV YEAR I SEM**

1.**Analyze** the role of Zero Trust Architecture in modern enterprise security. **Evaluate** its advantages and limitations compared to traditional perimeter-based models. **(CO4)**

2. **Analyze** the implications of AI-based cyberattacks on traditional risk management frameworks. Recommend adaptive measures to address evolving threats. **(CO5)**

**ELECTRONICS MEASUREMENTS & INSTRUMENTATION IV YEAR I SEM**

1. **Design** RMS defector for a wideband voltmeter. **(CO1)**
2. Distance measurement using ultrasonic sensor.**(CO2)**
3. Consider a wheatstone bridge comprising four resistances 200 Ω,20Ω,400Ω,40Ω.**When** the bridge is converted to a 1.5v battery, **what** will be the current through the individual resistors?(**CO3)**
4. The method of 300MHz isolated handheld oscilloscope design.**(CO2)**