Open Book Test – Advanced Software Engineering (90 Minutes)

MIT Vishwaprayag University, Solapur

Program: MCA (Postgraduate)
Course: Advanced Software Engineering
Duration: 90 Minutes
Marks: 40

Problem Scenario: Smart Waste Collection System for Solapur City

The Solapur Municipal Corporation plans to introduce a **Smart Waste Collection System** to improve urban cleanliness and efficiency in garbage collection.
The system should track **waste bins, garbage trucks, collection routes**, and **citizen complaints** using IoT sensors and mobile apps.

As part of the software engineering team, you are asked to prepare a **Preliminary Software Engineering Proposal** for developing this system.

Section 1 – Software Development Approach (10 Marks)

1. Choose a suitable **Software Development Life Cycle (SDLC)** model (e.g., Agile, Iterative, Incremental, or Waterfall).
2. Justify your choice by considering:
    - Real-world dependencies (hardware, IoT devices, municipal coordination)
    - Frequent requirement changes or data updates
    - Scalability for future expansion to other areas
3. Briefly describe how each phase (requirements, design, implementation, testing, maintenance) applies to this project.

Section 2 – Estimation and Planning (08 Marks)

1. Use any **one estimation method** (Story Points, Function Points, or T-shirt Sizing).
2. Estimate the effort for **3–4 key modules**, such as:

    - Bin Monitoring (IoT data)
    - Route Optimization
    - Citizen Feedback Portal
    - Admin Dashboard
3. Mention your **assumptions** (team composition, sprint duration, development timeline).

Section 3 – System Architecture and Design (17 Marks)

1. Propose a **high-level architecture** for the system.
    - Choose between **Monolithic** or **Microservice-based** architecture and justify your choice.
2. Identify major **modules/components** (e.g., Sensor Data Service, Vehicle Tracking, Alert Management).
3. Create a simple **UML Component Diagram** or **C4 Container Diagram** showing how these components interact.
4. Mention **two design patterns** that you would apply.
    - Explain how they solve specific design or integration challenges.

Section 4 – Deployment Awareness (05 Marks)

1. Briefly describe how your system would move from **development → testing → deployment → production.**
    - Mention basic awareness of **version control** and **deployment process.**
2. You are not required to define CI/CD pipelines — focus on conceptual understanding.

Expected Deliverables

Your **2–3 page handwritten or typed proposal** should include:

- SDLC model and rationale
- Effort estimation
- System architecture sketch or diagram
- Mention of design patterns
- Basic deployment overview

Evaluation Scheme

Criteria	Marks	Description
SDLC Model & Justification	10	Clear reasoning for the chosen model
Estimation & Planning	08	Practical and well-structured assumptions
Architecture & Design Patterns	17	Logical structure and relevant pattern use
Deployment Awareness	05	Understanding of basic software release flow
Total	**40**	

💡 Bonus Question (Optional, +5 Marks)

Suggest **one innovative feature** that can make the Smart Waste Collection System more efficient or community-friendly, such as:

- Rewarding citizens for timely waste segregation
- Predictive collection based on fill-level sensors
- Integration with a city cleanliness leaderboard

🧩 Instructions for Students

- This is an **open-book test** — you may refer to notes, slides, or textbooks.
- Focus on **clarity, reasoning, and structured presentation**.
- You may include simple **diagrams, tables, or bullet points**.
- Your goal is to demonstrate how **software engineering principles** apply to a **real-world Solapur problem**.