Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	18 February 2026
Team ID	LTVIP2026TMIDS24197
Project Name	Civil Engineering Insight Studio
Maximum Marks	4 Marks

Table-1: Components & Technologies

S.No	Component	Description	Technology
1	User Interface	Web-based interface where users upload images and enter prompts	Streamlit (Python-based Web UI)
2	Application Logic-1	Handles user input processing, image formatting, prompt creation	Python
3	Application Logic-2	AI model interaction and content generation logic	Gemini Vision API
4	Application Logic-3	Response formatting and structured documentation generation	Python (Prompt Engineering + Data Formatting)
5	Database	Optional structured storage of reports and logs	SQLite / MySQL
6	Cloud Database	Cloud-based storage for scalable deployment	Firebase / Cloud SQL (Optional)
7	File Storage	Storage of uploaded images and generated reports	Local File System / Cloud Storage
8	External API-1	AI-based image and text analysis	Gemini API
9	External API-2	Optional external integration (future enhancement)	Structural Standards API (Future Scope)
10	Machine Learning Model	Multimodal AI model for image + text understanding	Gemini Vision Model
11	Infrastructure (Server / Cloud)	Application deployment	Local Deployment / Streamlit Cloud / AWS / Azure

Table-2: Application Characteristics

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Frameworks used for UI and backend development	Python, Streamlit
2	Security Implementations	API key stored securely in .env file, environment variable protection, HTTPS communication	python-dotenv, HTTPS encryption
3	Scalable Architecture	Modular architecture separating UI, backend logic, and AI API for scalability	3-Tier Architecture
4	Availability	Can be deployed on cloud platforms ensuring high uptime	Streamlit Cloud / AWS / Azure
5	Performance	Efficient API calls, lightweight UI, optimized image handling	Python Optimization, Caching (Streamlit Cache)

Architecture Explanation

The system follows a simplified 3-tier architecture:

1. Presentation Layer
   - Streamlit-based web interface
   - Accepts user prompt and image
2. Application Layer
   - Python backend processes image
   - Prepares structured prompt
   - Communicates with Gemini Vision model
3. AI & Storage Layer
   - Gemini API performs multimodal analysis
   - Generates structural insights
   - Optional storage for reports and logs

Deployment Options

Local Deployment:

- Python 3.x
- Streamlit server
- Local filesystem storage

Cloud Deployment:

- Streamlit Cloud
- AWS EC2
- Azure App Services
- Docker container (future enhancement)