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

Date	28 February 2026
Team ID	LTVIP2026TMIDS46423
Project Name	Intelligent SQL Querying with LLMs Using Gemini Pro
Maximum Marks	4 Marks

Technical Architecture:

The deliverable includes the architectural structure of the SQL-LLM system along with component classification and technology mapping.

Reference: https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/

Table-1: Components & Technologies

S.No	Component	Description	Technology
1	User Interface	Web-based interface for natural language query input	Streamlit (Python Web UI)
2	Application Logic-1	Natural language input handling and preprocessing	Python
3	Application Logic-2	SQL generation logic using prompt engineering	Python + OpenAI API
4	Application Logic-3	SQL validation and error handling	Python + SQLAlchemy
5	Database	Relational database for executing SQL queries	SQLite / MySQL / PostgreSQL
6	Cloud Database (Future Scope)	Cloud-based database integration	AWS RDS / Azure SQL
7	File Storage	Log storage and configuration files	Local File System
8	External API-1	Large Language Model API for SQL generation	OpenAI API
9	External API-2	Authentication services (Future Scope)	OAuth / Google Auth
10	Machine Learning Model	Natural Language to SQL Conversion Model	GPT-based LLM
11	Infrastructure (Server / Cloud)	Application deployment	Local System / AWS / Azure (Future Deployment)

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Web framework and database connectors	Streamlit, SQLAlchemy, Pandas
2	Security Implementations	API key protection, SQL validation, restricted query execution	dotenv, Input validation, Parameterized queries
3	Scalable Architecture	Modular layered design supporting scaling	Python modular architecture
4	Availability	Application can be deployed on cloud for high availability	AWS EC2 / Azure VM
5	Performance	Optimized prompt design, efficient database queries	LLM prompt engineering + Indexed database

References:

https://c4model.com/
https://aws.amazon.com/architecture
https://www.ibm.com/cloud/architecture