**Requirement Analysis Phase**

**Solution Requirements (Functional & Non-functional)**

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| Date | 28 June 2025 |
| Team ID | LTVIP2025TMID36180 |
| Project Name | **Personalised learning with generative AI and Lms Integration** |
| Maximum Marks | 4 Marks |

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

**A. User Management (Citizens & Administrators)**

* **User Registration/Authentication**:
  + Citizens and administrators should be able to sign up and log in via **OAuth** using **Google Classroom** credentials.
  + Admins should be able to manage multiple users (students, educators) and their roles.
* **Role-Based Access Control (RBAC)**:
  + Citizens, educators, and administrators should have different access rights (e.g., view-only, edit quizzes, manage content).

**B. Personalized Learning & Quizzes**

* **Dynamic Quiz Generation**:
  + **Granite LLM** should generate personalized quizzes based on the student's learning history, course enrollment, and current performance.
  + Quizzes should adapt in difficulty based on real-time student responses.
* **Feedback Engine**:
  + The system must provide instant, AI-generated feedback after quizzes, highlighting strengths and areas for improvement.
  + Feedback should be personalized, providing actionable next steps.
* **Learning Path Recommendations**:
  + Based on student progress, **Pinecone Vector Store** should recommend personalized content (e.g., articles, exercises, videos).
* **Diagnostic Testing**:
  + Before starting a learning path, students should take a diagnostic test, which helps **Granite LLM** adjust content difficulty and track learning progression.

**C. Analytics & Reporting (for Educators and Admins)**

* **Student Performance Dashboard**:
  + Educators should have a dashboard to view student progress, quiz scores, and learning trends.
* **City-Wide Learning Insights**:
  + Administrators should be able to view overall city or district-level performance and KPIs (e.g., pass rates, average quiz scores, at-risk students).
* **Custom Reports**:
  + Ability to generate reports on specific student demographics, course performance, or learning outcomes.

**D. Integration with Google Classroom**

* **Automatic Syncing**:
  + Sync courses, student enrollments, and assignments from **Google Classroom** to **EduTutor AI**.
  + Maintain alignment between **EduTutor AI** quizzes and **Google Classroom** assignments for a seamless learning experience.

**E. Adaptive Learning and Progress Tracking**

* **Continuous Progress Tracking**:
  + Track and store historical data on quizzes, feedback, and learning milestones.
* **Gamification Features**:
  + Introduce badges, points, and leaderboards to enhance engagement and motivation.
  + Track completion streaks, performance improvement, and skill mastery.

**Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

**A. Scalability**

* **Horizontal Scaling**:
  + The system must scale horizontally to support growing numbers of users, especially during peak usage times.
* **Cloud-based Infrastructure**:
  + Must be deployable on cloud platforms (AWS, GCP, Azure) with auto-scaling capabilities.
* **Database Scalability**:
  + The database (for **user data**, **quiz results**, **feedback**) must support scaling to accommodate thousands or millions of records.

**B. Reliability & Availability**

* **High Availability**:
  + The system should be available 24/7, with minimal downtime for updates or maintenance.
* **Fault Tolerance**:
  + The system must gracefully handle failures without affecting user experience (e.g., retry mechanisms, failover strategies).

**C. Performance**

* **Low Latency**:
  + The time between submitting a quiz and receiving feedback must be within **2-5 seconds**.
  + Dynamic quiz generation should occur in near real-time.
* **Fast Response Time**:
  + API requests for performance data, recommendations, and reports should respond in **under 1 second**.

**D. Security**

* **Data Privacy**:
  + All user data (especially **student records**) must be encrypted and stored in compliance with **GDPR** and other relevant data protection regulations.
* **Secure Authentication**:
  + Implement **OAuth 2.0** for secure authentication, and ensure proper session management (JWT, refresh tokens).
* **Role-Based Access Control (RBAC)**:
  + Different users (citizens, educators, admins) must have clear permissions to restrict access to sensitive data.

**E. User Experience (UX)**

* **Responsive Design**:
  + The platform must be fully responsive, providing a seamless experience on both desktop and mobile devices.
* **Simple and Intuitive UI**:
  + The frontend must have a user-friendly interface that requires minimal training for users (students, educators, admins).
* **Interactive Feedback**:
  + Provide engaging and easy-to-understand feedback for students that motivates improvement.