

// MICROSERVICES AND BILLING REQUIREMENTS //

Test Application – Backend Architecture & Cost Overview

The test/exam application is built using **Flutter** for the frontend and **Firebase** as a serverless backend. The system follows a **microservice-based architecture**, where each functional responsibility is handled by a dedicated Firebase service.

Microservices / Backend Modules

1. Authentication Service (**Firebase Auth**)

Handles user sign-up, sign-in, session management, and password recovery using email/password or social login.

2. User Profile Service (**Cloud Firestore**)

Stores user registration details, subscription status, test history, and attempt records.

3. Test Management Service (**Cloud Firestore – Admin Only**)

All test content (paragraphs, questions, metadata, pricing, activation status) is created, updated, and managed only by admin users. Normal users have read-only access.

4. Subscription & Access Control Service (**Firestore + Cloud Functions**)

Manages test subscriptions and validates user access before allowing test attempts.

5. Test Attempt & Result Service (**Firestore + Cloud Functions**)

Stores user answers, calculates scores securely, maintains result history, and supports re-attempts.

6. Notification Service (**Firebase Cloud Messaging**)

Sends test reminders, subscription alerts, and important updates.

7. Analytics & Monitoring (**Firebase Analytics**)

Tracks user engagement, test usage, and overall app performance.

Admin-Only Control

Admins are identified using a role-based system in Firestore or custom claims.

Firebase security rules ensure that only admins can create, update, or delete tests, while users can only read test data and submit attempts. This guarantees data security and prevents manipulation.

Firebase Usage & Pricing :

Free Tier (Spark Plan)

- **Authentication:** Free for up to **50,000 monthly active users** (email/social login)
- **Firestore Database:**
 - 50,000 reads/day
 - 20,000 writes/day
 - 1 GB storage
- **Cloud Functions:**
 - 2 million invocations/month
- **Cloud Messaging & Analytics:** Free
- **Hosting (optional):**
 - 10 GB storage & bandwidth

Paid Usage (Blaze – Pay as You Go)

Billing is required only when usage exceeds free limits:

- Firestore reads/writes: charged per **100k operations**
 - Cloud Functions: charged per million invocations **beyond free tier**
 - Auth: **charged only beyond 50k MONTHLY USERS**
 - **Typical early-stage cost:** ₹**500–₹1,500/month** for moderate traffic
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