

# // MICROSERVICES AND BILLING REQUIREMENTS //

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## 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**.

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### Admin-Only Control

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

**Firestore 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.

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## Firestore 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
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### 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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