**Test Plan – Face Recognition Attendance System**

**1. Project Overview**

The Face Recognition Attendance System is a real-time application built using Python, OpenCV, and Firebase. It captures live webcam input, matches detected faces against a known encoded dataset, logs attendance to Firebase Realtime Database, and updates the interface based on match results.

**2. Objectives**

* Validate face detection and recognition accuracy
* Ensure Firebase data read/write operations function correctly
* Verify UI response and notification messages
* Test robustness against invalid input, lighting, and camera feed errors
* Confirm encodings are stored and loaded properly

**3. Scope of Testing**

* **Functional Testing** (face match, attendance log)
* **UI Testing** (real-time webcam view, overlays, feedback)
* **Database Testing** (Firebase Realtime DB & Storage)
* **Regression Testing** (code changes don't break functionality)

**4. Testing Types**

* **Manual Testing**
* **Smoke Testing**
* **Functional Testing**
* **Integration Testing** (webcam + encoding + Firebase)
* **Usability Testing** (user feedback on accuracy and ease of use)

**5. Tools & Frameworks**

* **Python** (OpenCV, face\_recognition, firebase-admin)
* *Optional:* **Pytest** (for encoding methods), **Postman** (Firebase DB check)
* **Real webcam** (for live tests)

**6. Test Environment**

* **OS:** Windows 10/11
* **Camera:** Built-in or external webcam
* **Python 3.x** with all dependencies installed
* **Firebase service credentials** set up locally
* **Live internet** for Firebase DB access

**7. Roles & Responsibilities**

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| **Role** | **Responsibility** |
| **QA Engineer** | Write test cases, execute tests, report bugs |
| **Developer** | Handle feature updates, bug fixes |
| **Firebase Admin** | Monitor DB access & performance |

**8. Test Deliverables**

* **Test Plan**
* **Test Case Document**
* **Bug Report Sheet**
* **Test Summary Report**

**9. Risks & Mitigation**

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| **Risk** | **Mitigation** |
| Poor lighting affects recognition | Test with varied conditions; suggest using good lighting |
| Face not detected due to encoding error | Add fallback or retry mechanism |
| Firebase not responding | Handle with connection timeout and retry logic |
| Camera access failure | Add friendly error and logging |

**10. Exit Criteria**

* 90%+ test cases passed
* All high severity bugs resolved
* Firebase operations verified across all users
* Stable performance over 10+ face matches in real-time