**VINAY PRAMOD NAMBIAR – AMENU4CSE21061**

**Report on Mobile App Development: Tetrus App**

**1. Introduction** The Tetrus App is a mobile application designed to bring the classic Tetris-style puzzle gameplay to modern mobile platforms. The app aims to provide users with a seamless, engaging, and interactive gaming experience while incorporating additional features like leaderboards, multiplayer functionality, and customizable themes. This report outlines the development process, key features, challenges faced, and future plans for the Tetrus App.

**2. Objectives**

* To develop a user-friendly mobile game with intuitive controls and a visually appealing interface.
* To include advanced features such as real-time multiplayer, achievements, and leaderboards.
* To ensure cross-platform compatibility for both Android and iOS devices.
* To optimize the app for performance and battery efficiency.

**3. Development Approach**

**3.1. Technology Stack**

* **Frontend:** Flutter for UI/UX development, ensuring a single codebase for Android and iOS.
* **Backend:** Firebase for real-time database, authentication, and cloud functions.
* **Game Engine:** Integration with Flutter’s animation libraries for smooth game mechanics.
* **Tools:** Visual Studio Code, Android Studio, and Xcode for development and debugging.

**3.2. Features Implemented**

* **Core Gameplay:** Classic Tetris-inspired puzzle mechanics with increasing difficulty levels.
* **User Profiles:** Player authentication via email or social media accounts.
* **Leaderboards:** Global and regional rankings powered by Firebase.
* **Multiplayer Mode:** Real-time competitive gameplay using WebSockets.
* **Customization:** Themes and soundtracks that players can unlock.

**4. Challenges and Solutions**

**4.1. Challenge: Ensuring Smooth Gameplay on Low-End Devices**

* **Solution:** Optimized animations and reduced asset sizes to improve performance.

**4.2. Challenge: Real-Time Multiplayer Synchronization**

* **Solution:** Implemented WebSocket-based communication for low-latency interactions and Firebase cloud functions for event handling.

**4.3. Challenge: Cross-Platform Consistency**

* **Solution:** Utilized Flutter’s cross-platform capabilities and thoroughly tested the app on various devices and screen resolutions.

**5. Testing and Quality Assurance** The Tetrus App underwent rigorous testing phases, including:

* **Unit Testing:** Ensured individual components, such as scoring logic, worked correctly.
* **Integration Testing:** Verified the interaction between UI and backend services.
* **User Testing:** Gathered feedback from a beta testing group to refine gameplay and interface.

**6. Future Enhancements**

* **Offline Mode:** Add offline gameplay with local leaderboard functionality.
* **AR Integration:** Introduce augmented reality (AR) elements to enhance user engagement.
* **Additional Game Modes:** Include cooperative gameplay and time-limited challenges.
* **Monetization:** Implement non-intrusive ads and in-app purchases for themes and customizations.

**7. Conclusion** The Tetrus App successfully combines nostalgic gameplay with modern features to appeal to a wide audience. With its smooth performance, engaging features, and cross-platform compatibility, the app has the potential to become a favorite among puzzle game enthusiasts. Continuous updates and user feedback will guide the future development of the app.