Report – Market Mechanics, Design Choices, and Methodology

Introduction:
An order book is the central mechanism in financial markets that organizes buy and sell orders for assets. Its main purpose is to facilitate transparent price discovery and efficient trade execution. This project simulates a simplified order book to illustrate how orders interact and how trades are generated.

Market Mechanics:
The order book maintains separate lists for buy and sell limit orders. Buy orders are prioritized by highest price and earliest timestamp, while sell orders are prioritized by lowest price and earliest timestamp. When a new order is added, it is compared against orders on the opposite side. Trades are executed whenever buy and sell prices overlap, following **price-time priority**. Partial fills occur when available quantities do not match exactly, ensuring realistic trading behaviour. Multiple trades can result from a single order depending on market depth.

Methodology and Design Choices:

- **Order Placement:** Users can enter multiple orders manually or via automated sequences. Orders include price, quantity, and a timestamp.
- **Matching Engine:** Each new order is checked against existing orders on the opposite side. Matching continues sequentially until the order is completely filled or no matching orders remain.
- **Data Structure:** Separate lists for buy and sell orders allow efficient sorting and easy management of the order queue.
- **Trade Logging:** Every executed trade records price, quantity, and order IDs, providing a complete record of market activity.
- **Simulation Patterns:** Orders were entered in controlled sequences to observe partial fills, multiple trades, and market dynamics, mimicking realistic exchange behaviour.

Conclusion:
This simplified order book captures the essential mechanics of an electronic market, including order prioritization, sequential matching, partial fills, and trade logging. The design choices focused on clarity and fairness while keeping the model extendable for future enhancements, such as market orders, cancellations, or real-time visualization.