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**REPUBLIC OF TURKEY**

**KADİR HAS UNIVERSITY**

**FACULTY OF ENGINEERING AND NATURAL SCIENCES**

**CMPE412 Computer Simulation**

**Project 2 - Manufacturing**

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# **1 INTRODUCTION**

The project simulates a manufacturing system consisting of multiple machines, each capable of processing items with a given process time. The simulation models the occurrence of process, breakdown, and repairs, simulating their impact on the overall system efficiency. The primary goal is to assess how these events affect the production flow over a specified simulation time.

# **2 SIMULATION RESULTS**

The simulation begins by initializing a set number of machines, each starting in a working state. Events are managed using a priority queue, which processes events based on their scheduled times and there is a breakdown of how the simulation progresses:

1. **Initialization:** Machines start in a working state, and initial process events are scheduled for each machine.
2. **Event Handling:**

* **Process Completion:** When a machine completes its processing, it schedules the next process event for the same machine unless a breakdown occurs.
* **Breakdown:** Randomly determined by a failure rate, a machine may break down after completing a process. When this happens, it switches to a non-working state and schedules a repair event.
* **Repair:** After a machine breaks down, it undergoes a repair process, transitioning back to a working state after a specified repair time.

1. **Simulation Termination:** The simulation continues processing events until either all scheduled events are handled or the specified simulation time is reached. Upon completion, the total simulation time is printed.

# **3 CONCLUSION**

In conclusion, the simulation effectively illustrates the operational dynamics of a manufacturing system. When we look at the key observations, it includes:

1. **Impact of Breakdowns:** Breakdown events significantly impact machine availability and, consequently, the overall production throughput.
2. **Maintenance Dynamics**: Timely repairs are critical in restoring machine functionality and minimizing downtime, highlighting the importance of maintenance strategies in enhancing system reliability.

This simulation serves as a model for assessing and optimizing manufacturing system performance, offering insights into the interplay between process efficiency, machine reliability, and maintenance strategies.