**Problem Statement Document**

**Project Title: *Dynamic Pricing Model for Resource Allocation in Fog Computing (GTRADPMFC)***

**1. Background**

Fog computing has emerged as an extension of cloud computing to bring computation and storage closer to end-users. With the rapid growth of IoT applications, users frequently request heterogeneous resources (e.g., CPU, RAM, storage) with varying deadlines and urgency. Efficient resource allocation is critical for maximizing performance while ensuring fairness and profitability for the Fog Service Provider (FSP).

Traditional fixed pricing models fail to capture the dynamic nature of demand and urgency in fog systems. Static pricing may lead to resource under-utilization, user dissatisfaction, or provider losses. To overcome this, **dynamic pricing mechanisms** are required that adapt prices based on user requests, deadlines, and past demand patterns.

**2. Problem Statement**

The challenge is to design a **dynamic pricing mechanism** that:

1. Allocates fog resources (CPU, RAM, storage) efficiently among multiple users.
2. Adjusts prices based on user demand patterns, urgency (deadlines), and historical requests.
3. Ensures fairness by preventing users from gaining advantage through misreporting their demands.
4. Maximizes provider profitability while maintaining resource utilization.

The proposed solution should consider both **similar past requests (L\*)** and **dissimilar past requests (L\*\*)**, weighted by a tunable parameter (δ), to calculate the final dynamic price.

**3. Objectives**

* To design and implement a **Generalized Time-Resource Aware Dynamic Pricing Model for Fog Computing (GTRADPMFC)**.
* To simulate user requests with varying resource demands and deadlines.
* To calculate dynamic prices using a weighted combination of past similar and dissimilar requests.
* To compare the performance of GTRADPMFC with benchmark models (First Minimum, Second Minimum, FogPrime).
* To evaluate results in terms of **profitability, fairness, and resource utilization**.

**4. Scope of the Project**

* The system focuses on **dynamic pricing**, not the physical deployment of fog infrastructure.
* Historical request data is synthetically generated for simulations.
* Users request resources in terms of CPU, RAM, and storage with specific deadlines.
* Performance will be benchmarked against existing models like **FogPrime** and **minimum-based algorithms**.

**5. Expected Outcomes**

* A dynamic pricing algorithm (GTRADPMFC) that adapts prices based on demand and deadlines.
* Higher profitability for service providers compared to FogPrime and benchmark models.
* Improved fairness by ensuring users cannot manipulate the system through misreporting.
* Efficient utilization of fog resources.

**6. Deliverables**

* Problem statement document.
* Algorithm design (flowchart + pseudocode).
* Simulation with sample request dataset.
* Comparison graphs and analysis (GTRADPMFC vs benchmarks).
* Final project report and presentation.