

## Part 1: Theoretical Analysis

### 1. Essay Questions

**Q1: Explain how Edge AI reduces latency and enhances privacy compared to cloud-based AI. Provide a real-world example (e.g., autonomous drones).**

Edge AI reduces **latency** by processing data locally on the device (at the "edge"), eliminating the need for a slow network round-trip to the cloud. It enhances **privacy** because sensitive raw data is processed and stays on the device, and only necessary, non-identifying insights (metadata) are transmitted to the cloud, if at all.

For an **autonomous drone**, Edge AI allows it to instantly execute **collision avoidance** maneuvers without waiting for cloud instructions (low latency) while ensuring surveillance video footage remains local and secure

**Q2: Compare Quantum AI and classical AI in solving optimization problems. What industries could benefit most from Quantum AI?**

- Quantum AI solves optimization problems by using **qubits** in **superposition** to explore exponentially more solutions simultaneously than Classical AI, promising **exponential speedup** for finding the absolute optimal answer.
- Key industries benefiting are **Finance** (portfolio optimization), **Drug Discovery** (molecular simulation), **Logistics** (complex routing), and **Energy** (smart grid balancing).