📎 Attachment 6: Quantum Computing and Its Impact on Future Technology

🔹 Title:

Quantum Computing: Redefining the Boundaries of Innovation in 2025 and Beyond

🎯 Objective:

To provide insights into how quantum computing is transforming problem-solving in fields like cryptography, materials science, and artificial intelligence.

💡 Key Concepts:

1. What is Quantum Computing?

Unlike classical computers (which use bits), quantum computers use qubits—quantum bits that can be in multiple states simultaneously (superposition) and interact through entanglement.

1. Unparalleled Processing Power:

Quantum machines can perform computations millions of times faster than traditional computers for certain complex problems.

1. Quantum Supremacy:

In 2025, tech giants like IBM and Google continue demonstrating quantum supremacy—solving problems unsolvable by classical computers within a practical time frame.

🌐 Applications in Real World:

Cybersecurity:

Quantum computers can crack traditional encryption (RSA) in seconds but also enable post-quantum cryptography (quantum-safe encryption methods).

Drug Discovery & Healthcare:

Quantum simulations help model molecular interactions, speeding up vaccine and drug development.

AI & Machine Learning:

Quantum-enhanced algorithms can train AI models faster and more efficiently.

Finance & Optimization:

Used for portfolio optimization, fraud detection, and predicting market trends.

📊 2025 Market Outlook:

The global quantum computing market is projected to reach $6.5 billion by 2025.

Government investments (like India’s NQM and U.S. National Quantum Initiative) are pushing research and industrial use-cases forward.

Companies like IonQ, Rigetti, IBM, and Google are leading the commercial race.

⚠️ Challenges Ahead:

Hardware Stability: Qubits are highly sensitive to noise, leading to errors.

Cryogenic Requirements: Many quantum processors require cooling near absolute zero.

Lack of Quantum Talent: Quantum programming and hardware engineering require highly specialized skills.

✅ Conclusion:

Quantum computing isn’t science fiction anymore—it’s a disruptive force poised to change industries. The world must prepare not only to adopt its benefits but also to address the ethical and technological challenges it brings.