

What is quantum computing? Advantage of quantum computing over classical computing.

- i. Quantum computing is a field of computer science that uses quantum mechanics to solve complex problems faster than classical computers.
- ii. Quantum computers use quantum bits, or qubits, to store and manipulate information.
- iii. The principles of quantum mechanics, like superposition and entanglement, allow qubits to encode more information than bits and perform multiple calculations at once.

Advantages:

- iv. **Speed:** Quantum computers can perform certain calculations much faster than classical computers. For example, quantum algorithms can factor large numbers exponentially faster than classical algorithms.
- v. **Parallel processing:** Quantum computers can perform multiple calculations simultaneously, which allows them to solve complex calculations faster.
- vi. **Optimization:** Quantum computers are well-suited for solving optimization problems, which involve finding the best solution from a large number of possibilities.
- vii. **Simulation:** Quantum computers can simulate quantum systems, which are difficult or impossible to simulate with classical computers.
- viii. **Energy efficiency:** Quantum computers are more efficient from an energy usage and carbon emissions standpoint than classical computers.
- ix. **Scaling:** Quantum computers scale exponentially, meaning that a 200 qubit machine is much more powerful than a 100 qubit computer.