



Mains Practice Question

Q. India needs to harvest quantum computing for strategic and economic development. Discuss.

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Approach

- Start the answer by briefly explaining what quantum computing is.
- Discuss the applications of Quantum Computing in India's context.
- Conclude Suitably.

Introduction

Unlike conventional computers which process information in 'bits' or 1s and 0s, Quantum computers compute in 'qubits' (or quantum bits). They exploit the properties of quantum mechanics, the science that governs how matter behaves on the atomic scale.

In this scheme of things, quantum computers process information in such a way that it can be a 1 and a 0 simultaneously. This state is called quantum superposition. Due to this, Quantum Technologies not just have ultra-fast computing capabilities, but also has strategic and economic advantages.

Body

Applications of Quantum Computing

- **Secure Communication:** China recently demonstrated secure quantum communication links between terrestrial stations and satellites.
 - This area is significant to satellites, military, and cybersecurity among others as it promises unimaginably fast computing and safe, unhackable satellite communication to its users.
- **Disaster Management:** Tsunamis, drought, earthquakes, and floods may become more predictable with quantum applications.
 - The collection of data regarding climate change can be streamlined in a better way through quantum technology.
- **Scientific Research:** It can help in solving some of the fundamental questions in physics related to gravity, black hole, etc.
 - Similarly, quantum computing could give a big boost to the Genome India project.
 - This in turn will have a profound impact on agriculture, food technology chains, and the limiting of farmland wastage.
- **Pharmaceutical:** Quantum computing could reduce the time frame of the discovery of new molecules and related processes to a few days from the present 10-year slog that scientists put in.
 - For instance, tracking protein behavior or even modeling new proteins with the help of quantum computers could be made easier and faster.
 - Tackling chronic diseases like cancer, Alzheimer's and heart ailments is a big possibility of

the technology.

- **Augmenting Industrial revolution 4.0:** Quantum computing is an integral part of Industrial revolution 4.0.
 - Success in it will help in Strategic initiatives aimed at leveraging other Industrial revolution 4.0 technologies like the Internet-of-Things, machine learning, robotics, and artificial intelligence across sectors will further help in laying the foundation of the Knowledge economy.

Conclusion

Realizing the potential application of quantum computing, the government of India launched the National Mission for Quantum Technologies & Applications. Under this government seeks to provide investment on a massive scale and on a par with similar programs announced recently by the United States and Europe.

However, the actual realization of this path-breaking technology remains one of the great challenges faced in the fields of Quantum Computing.

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