Quantum Computer

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Why is in news? Shri Rajeev Chandrasekhar inaugurates the two-day symposium on the Quantum Computing Ecosystem organised by C-DAC

The Minister of State for Electronics & Information Technology and Skill Development & Entrepreneurship, said that Quantum Computing will be at the core of India's growth and expansion in India's Techade.

"It is PM's vision to **create a India centric Quantum tech ecosystem** with partners and players around the world. We are working together to build an ecosystem of innovation, along with startups, R&D laboratories, higher education institutions. Quantum Computing will be at the **core of the growth and expansion in India's Techade**," the Minister said, while virtually inaugurating a **two-day Symposium on the Quantum Computing Ecosystem** held at C-DAC, Pune.

The symposium **aims to project India's capabilities in Quantum Computing**.

It aims to explore the technologies, systems and subsystems which make up the building blocks of quantum computers and bring about a synergy among key stakeholders to build a commercial scale Quantum Computer.

Emphasising that Technologies such as Quantum Computing will be at the core of country's economic expansion in the India decade.

On one hand of the spectrum at the cutting edge we intend to build capabilities in quantum and high performance computing and on the other hand we want to build consumer products, digital products, devices and solutions and **allow more digital empowerment of the 1.2 billion Indians** who will be **connected to the internet by 2025-2026** .

Quantum Technology/Computing:

Quantum computing is a rapidly-emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers.

Quantum Technology is based on the **principles of Quantum mechanics** that was developed in the early 20th century to describe nature at the scale of atoms and elementary particles.

The first phase of this revolutionary technology has provided the foundations of our understanding of the physical world, including the interaction of light and matter, and led to ubiquitous inventions such as lasers and semiconductor transistors.

A second revolution is currently underway with the goal of putting properties of quantum mechanics in the realms of computing.

Difference Between Conventional and Quantum Computing:

Conventional computers process information in **'bits' or 1s and 0s**, following classical physics under which our computers can process a '1' or a '0' at a time.

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

The basic properties of quantum computing are **superposition, entanglement, and interference**.

Applications:

Secure Communication: China recently demonstrated secure quantum communication links between terrestrial stations and satellites. This area is significant to satellites, military and cyber security among others as it promises unimaginably fast computing and safe, unhackable satellite communication to its users.

Research: It can help in solving some of the fundamental questions in physics related to gravity, black hole etc. Similarly, the quantum initiative could give a big boost to the **Genome India project**, a collaborative effort of 20 institutions to enable new efficiencies in life sciences, agriculture and medicine.

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.

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.

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.

केन्द्रीय बजट
UNION BUDGET 2020

Budget 2020 announced Rs 8,000 crore over the next 5-yrs in the National Mission on Quantum technology and its applications

- The areas of focus for the NM-QTA Mission will be in fundamental science, translation, technology development and towards addressing issues concerning national priorities
- The mission can help prepare next generation skilled manpower, boost translational research and also encourage entrepreneurship and start-up ecosystem development.
- Quantum principles will be used for engineering solutions to extremely complex problems in computing, communications, sensing, chemistry, cryptography, imaging and mechanics

- Their applications which will be boosted include those in aero-space engineering, numerical weather predictions, simulations, securing the communications & financial transactions, cyber security, advanced manufacturing, health, agriculture, education
- It can bring India in the list of few countries with an edge in this emerging field will have a greater advantage in garnaring multifold economic growth and dominent leadership role

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