Indian Army sets up Quantum Lab, Artificial Intelligence Centre

For Prelims: Quantum Computing, Artificial Intelligence, Internet-of-Things, Industrial Revolution 4.0.

For Mains: Applications of Quantum Technology and associated Challenges, Artificial Intelligence and its advantages and disadvantages.

Why in News

The **Indian Army** has set up a **Quantum Computing Laboratory** and a **centre for** Artificial Intelligence **in Mhow, Madhya Pradesh.**

Key Points

- **About:**
  - The **Quantum Computing Laboratory** has been established with the help of the **National Security Council Secretariat (NSCS)**, to spearhead research and training in this key developing field.
    - National Security Council is a three-tiered organization that **oversees political, economic, energy and security issues** of strategic concern.
  - Indian Army has also established an Artificial Intelligence (AI) Centre at the same institution with over **140 deployments in forward areas and active support of industry and academia.**
  - Training on cyber warfare is being imparted through **a state-of-the-art cyber range and cyber security labs.**
- **Objective:**
  - The two Centres will carry out **extensive research in developing the transformative technologies** for use by the armed forces.
  - The Centres will also **facilitate the research and training in the developing field of Quantum and artificial intelligence.**
  - It will help it facilitate the next generation of communication and **transform the current system of cryptography to post-quantum cryptography.**
  - The key thrust areas of Quantum Technology are **Quantum Key Distribution**, **quantum computing and quantum communication.**
    - **QKD,** also called Quantum Cryptography, is a mechanism to develop secure communication.

Quantum Technology/Computing

- **About:**
  - 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.

- Using **quantum superposition**, a set of unbreakable codes or super-speedy information processing, **quantum computers** are able to mimic several classical computers working in parallel.
  - 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 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 popular inventions such as **lasers and** semiconductor **transistors.**

- **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 holes etc.
    - Similarly, the quantum initiative could give a big boost to the **Genome India project.**
  - **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.
- **Challenges Associated with Quantum Computing:**
  - The dark side of quantum computing is the **disruptive effect that it can have on cryptographic encryption**, which secures communications and computers.
  - It might pose a challenge for the government also because if this **technology goes into the wrong hands, all the government's official and confidential data will be at risk** of being hacked and misused.
- **Related Indian Initiatives:**
  - Budget 2020 allocated Rs 8000 Crore to a **National Mission on Quantum Technologies & Applications (NM-QTA)** for a period of five years.
  - In 2018, the Union Cabinet approved the launch of the **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)** to make India a leading player in Cyber-Physical Systems.
  - In 2018, the government initiated serious discussions in quantum technologies and kick started research projects across 51 organisations under QUEST – **Quantum Enabled Science and Technology.** However, no significant progress is made in this field until NM-QTA.

Source: IE