

# Science and Technology Class 10

7th August, 2023 at 9:00 AM

## A BRIEF OVERVIEW OF THE PREVIOUS CLASS - (09:08 AM)

### APPLICATIONS OF 5G TECHNOLOGY- (09:10 AM)

- 5G networks have high-speed low latency, which can have applications in many areas -
- **1) Augmented Reality and Virtual Reality Extended reality- (AR, VR, ER)-**
- AR is a technology that overlays digital information in the real-world environment.
- VR is a technology that creates an immersive entirely virtual environment often using a headset or similar devices, users can interact with digital objects creating a sense of presence in the virtual world.
- Mixed reality combines virtual and real-world environments, allowing users to interact with both simultaneously.
- **2) (IoT) Internet of Things -**
- It refers to the network of interconnected devices embedded with sensors, software, and network connectivity that enables them to collect and exchange data.
- It revolves around the idea of connecting everyday objects to the internet, enabling them to communicate with each other and with humans.
- 5G can play a very important role in the IOT network.
- For example - Autonomous vehicles, and remote healthcare.

### CHALLENGES - (09:34 AM)

- **1) Infrastructure deployment -**
- 5G requires a significant upgrade to the existing network.
- For example - Base stations should be connected with optical fiber cables to each other.
- **2) Spectrum availability -**
- The allocation of suitable spectrum can be a challenge as 5G is using both low and high-frequency bands.
- **3) High-Frequency waves are susceptible to signal degradation.**
- **4) 5G relies heavily on software components**, thus we need to invest in cyber security to protect user data and prevent cyber attacks.
- **5) 5G can further contribute** to the rural and urban digital divide in India.

### VISIBLE LIGHT COMMUNICATION - (LiFi) (10:08 AM)

- It is a wireless communication technology that uses visible light to transmit data.
- It works by modulating the intensity of light emitted by LED bulbs which can be detected by a receiver.
- This communication enables higher data rates, many times faster than a typical Wi-Fi. However, It is limited in coverage that is confined within a room.
- VLC signals can be disrupted, by other light sources such as artificial light or sunlight.

## **SUPERCOMPUTERS - (10:54 AM)**

- Supercomputers are designed to perform highly complex calculations and data-intensive tasks at extremely high speeds.
- **They differ from normal day-to-day computers in several ways -**
- **1) Processing power -**
- They are capable of performing trillions of calculations per second.
- **2) Parallel processing -**
- They can perform multiple calculations simultaneously which is called parallel processing.
- In contrast, normal computers execute tasks in distinct series of operations known as serial processing.
- Supercomputers have a large amount of memory and specialized hardware to support high processing power.
- Their capacity is measured in '**FLOPS**' (**F**loating **P**oints **O**peration **P**er **S**econd).

## **APPLICATIONS OF SUPERCOMPUTERS - (11:01 AM)**

- **1) Weather prediction and climate modeling.**
- **2) Scientific research-**
- **For example -**
- a) Computational Biology -
- It is an interdisciplinary field that develops and applies computational methods to analyze large collections of biological data such as genetic sequences protein samples, etc.
- b) Astrophysics.
- c) Particle Physics.
- d) Material sciences.
- e) Discovery of drugs.
- **3) Big Data analytics -**
- It is the process of examining and extracting meaningful insights from large and complex data sets, that cannot be analyzed through traditional methods.
- **4) Optimization -**
- It is the process of finding the best possible solution for a given problem, given the constraints.
- Supercomputer computers are used in optimization to accelerate the solution search process by performing massive amounts of calculations in parallel.

### **SUPERCOMPUTING IN INDIA - (11:33 AM)**

- The first supercomputer was **PARAM 8000** in 1991, developed by **C-DAC (Center For Development And Advanced Computing)**.
- Pratyush and Mihir are two powerful supercomputers, used for weather prediction and climate modules.
- **National Supercomputer Mission, 2015 -**
- It envisages, empowering our research institutions by installing a supercomputing grid comprising more than 70 high-performance computing facilities.
- These facilities will be networked on **Optical Fiber Cable Network** as part of the National Knowledge Network Program.
- It is being implemented by the Department of Science and Technology, Department of Electronics and IT via, IISC Bangalore, and C-DAC.
- Many supercomputers have been built under this mission including **AIRAWAT, and Param Siddhi AI**, the two fastest supercomputers in India.
- The mission is being implemented in three phases with more and more indigenization in subsequent phases.

### **CHALLENGES - (11:43 AM)**

- 1) Cost - They are extremely expensive to build and maintain.
- 2) Power consumption and cooling requirement - Because of the large amount of power consumption and cooling requirement, they are not considered environmentally friendly.
- 3) High import dependence for India.
- 4) Limited availability of skilled workforce and the issue of brain drain (top minds going outside India).

**THE TOPIC OF DISCUSSION FOR THE NEXT CLASS WILL BE QUANTUM TECHNOLOGIES.**