Science and Technology Class 17
7th October, 2023 at 9:00 AM

GRAND UNIFIED THEORY AND THEORY OF EVERYTHING (09:07 AM)

- A theory that can combine three fundamental interactions- electromagnetic interaction, strong interaction and weak interaction- is called the Grand unified theory.
- The two most successful theories of the 20th century are Quantum Mechanics and the General Theory of Relativity.
- While Quantum mechanics explains nature at a very small scale, the General Theory of Relativity is a theory of Gravity that explains nature at a larger scale such as stars, planets, and galaxies.
- However, a theory that can combine both Quantum mechanics and the General Theory of Relativity in One has proven to be futile. Such a theory can be called a theory of everything.
- The two most famous candidates are **String theory and Quantum loop gravity.**

JC BOSE (09:26 AM)

- He was a polymath, a physicist, a botanist, and a science fiction author.
- As a physicist, his work included research on electromagnetic waves specifically in microwave optics.
- He demonstrated that millimeter waves can propagate through solid objects similar to X-rays.
- He contributed to wireless communication. He demonstrated the feasibility of wireless communication by transmitting radio waves over a distance of 75 feet.
- As a botanist, he hypothesized that plants respond to external stimuli. He invented a device called a **Crescograph** which could accurately measure the growth of plants and detect their response to light, heat, and electric shock among others.
- He never commercialized his patents and invited other scientists to work on his inventions without any licensing.
- Thus, his primary interest was the pursuit of knowledge and scientific advancement.
- He wrote science fiction in Bangla and he became a fellow of the Royal Society, the first Indian to receive this honour.

DR. HARGOBIND KHURANA (09:39 AM)

- Dr. Khurana was awarded the Nobel Prize for Physiology or Medicine in 1968 for the interpretation of genetic code and its function in protein synthesis.
- He constructed the world's first synthetic gene paving the way for advancement in the field of genetic engineering and biotechnology.
- He contributed to the science of **Polymerase Chain reaction** which is used to detect genetic material from a specific organism like a virus.
- He also discovered the **structure of the Transfer RNA molecule.**

ROBOTICS (09:59 AM)

- Robots are machines that can perform tasks automatically or with minimal human intervention.
- It is a multidisciplinary field that combines elements of mechanical engineering, electrical engineering, computer science, AI and material sciences to design, build and operate robots.
- Robots are equipped with various sensors to perceive their environment.
- The sensory data collected by robot sensors is sent to its CPU.
- AI can play a significant role. E.g. Machine learning algorithms are employed to improve robots' decision-making capabilities.
- Robotics has **applications in many areas-**
- **Precision Agriculture-** Robots and drones equipped with sensors can monitor crops, Soil conditions, and water levels enabling targeted interventions such as irrigation and fertilisation.
- Autonomous robots can harvest crops, Remove weeds or pests, can work as a scarecrow among others.
- **Healthcare and Medicine-**
- Robotic surgical systems assist surgeons with greater precision and minimum invasiveness.
- Robotic devices help in physical therapy and rehabilitation.
- UAVs are being used for surveillance, intelligence gathering and also for delivering weapons.
- In bomb disposal mechanisms robots are being used.
- **Space-** Planetary and lunar exploration can not be imagined without space robotics.
- **Logistics-** Robots are used for both warehousing management and the delivery of goods. This can also be helpful in disaster management to deliver food packets in disaster-affected areas.
- **Manufacturing-** Jobs of assembly lines are being automated and replaced by robots.
- **Hazardous work -** Manual scavenging, Chemical waste management, Nuclear cleaner, mining, search and rescue in hazardous environments such as collapsed buildings, etc.

JOBS VS AUTOMATION (10:45 AM)

- India is witnessing a demographic dividend (the percentage of the young population is highest). We need to figure out how to create jobs for millions who are joining the labour force every year.
- This is at a time when intelligent machines are becoming better at doing tasks that traditionally require human beings.
- Robots can replace human labour because of increased efficiency, precision and accuracy, safety, cost saving, 24*7 operation, etc.
- Blind opposition to automation may not be the right step forward because automation also leads to the creation of new jobs.
- We also need to acknowledge that the assumption of only limited work in an economy is not correct. Human desires are unlimited compared to the supply of labour.
- At the same time, automation can lead to job displacement, income inequality, and over-reliance on technology.
- In fact in some industries, human touch and emotional connections are essential which robots may not be able to replicate.
- **Way Forward**
- It is very difficult to reconcile the issue of jobs vs automation which requires a **multi-pronged strategy such as**
- Invest in education and skill development, particularly in STEM courses.
- Promoting lifelong learning
- Focus on emerging industries such as renewable energy, AI, Data Analytics, Advanced manufacturing, etc.
- Job reskilling and transition programs.
- Social safety nets to support workers during periods of transition and job displacement.
- All this requires a proactive policy framework that anticipates the impacts of automation on the job market and can leverage automation to derive economic growth and create new opportunities.

SYLLABUS IS COMPLETE.