

You & Technology Jan-2020



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GOOD MORNING TIMES S&T (JANUARY-2020)

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General Studies Paper-3 – S&T – January 2020

1) 'Virtual human' NEONs

The first project of Samsung's Star Labs, NEONs are being called the world's first artificial humans.

What are they?

- NEONs are computationally created virtual humans — the word derives from NEO (new) + humaN.
- For now the virtual humans can show emotions when manually controlled by their creators.
- But the idea is for NEONs to become intelligent enough to be fully autonomous, showing emotions, learning skills, creating memories, and being intelligent on their own.

How do they work?

There are two core technologies behind his virtual humans.

1. First, there is the proprietary CORE R3 technology that drives the "reality, real time and responsiveness" behind NEONs.
2. The next stage will be SPECTRA, which will complement CORE R3 with the "spectrum of intelligence, learning, emotions and memory".

How could NEONs be used?

NEONs might be the interface for technologies and services.

- They will answer your queries at a bank, welcome you at a restaurant, or read out the breaking news on television at an unearthly hour.
- This form of virtual assistance would be more effective, for example, while teaching languages, as NEONs will be capable of understanding and sympathising.

How are NEONs different from Virtual Assistants?

Virtual Assistants now learn from all the data they are plugged into. NEONs will be limited to what they know and learn. Their leaning could potentially be limited to the person they are catering to, and maybe her friends — but not the entire Internet. They will not be an interface for you to request a song, rather they will be a friend to speak to and share experiences with, says Star Labs.

2) Black Box in an airplane

On January 8th, a passenger plane bound for Ukraine exploded as it slammed into a field in Iran, just minutes after takeoff killing at least 176 people on board. Questions remain about the cause, and there have been some contradictory statements from officials in both Iran and Ukraine.

- The plane's so-called black boxes could help answer some of those questions, but Iranian officials may not turn the devices over to Boeing, which would typically be involved in an investigation into what went wrong.

What is a Black Box?

Any commercial aeroplane or corporate jet is required to be equipped with a cockpit voice recorder and a flight data recorder. It is these two items of separate equipment which we commonly refer to as a 'Black Box.' While they do nothing to help the plane when it is in the air, both these pieces of equipment are vitally important should the plane crash, as they help crash investigators find out what happened just before the crash. To help locate the cockpit voice recorder and a flight data recorder in the aftermath of a plane crash that occurs at sea, each recorder has a device fitted to

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it known as an Underwater Locator Beacon (ULB). The device is activated as soon as the recorder comes into contact with water and it can transmit from a depth as deep as 14,000 feet. Also, to help investigators find them; a Black Box is not actually black at all, but bright orange.

3) ARTIFICIAL INTELLIGENCE

Recently, various prominent personalities have highlighted the need of regulating Artificial Intelligence (AI).

- Renowned personalities like Bill Gates, Elon Musk, Sundar Pichai, Jaron Lanier have cautioned against an impending robot apocalypse, which might come as a result of Artificial Intelligence.
- Stephen Hawking had highlighted that AI could destroy humanity if we aren't proactive to avoid the risks of unfettered AI.

About Artificial Intelligence (AI)

- It is simulation of human intelligence processes by machines, especially computers.
- It refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making and execute tasks in real time situations without constant supervision.
- Particular applications of AI includes expert systems, speech recognition and machine vision.
- It encompasses machine learning, where machines can learn by experience and acquire skills without human involvement.

Significance of Artificial Intelligence (AI)

- It has the potential to overcome the physical limitations of capital and labour and open up new sources of value and growth.
- It has the potential to drive growth by enabling
 - o Intelligent automation i.e. ability to automate complex physical world tasks.

o Innovation diffusion i.e. propelling innovations through the economy.

- Role in social development and inclusive growth: access to quality health facilities, addressing location barriers, providing real-time advisory to farmers and help in increasing productivity, building smart and efficient cities etc.

- The exponential growth of data is constantly feeding AI improvements.

Examples of AI use in India-

- A Statement of Intent has been signed between NITI Aayog and IBM to develop Precision Agriculture using Artificial Intelligence (AI) in Aspirational Districts.
- Microsoft India is using AI sensors to make farming and healthcare smart.

Need for regulating Artificial Intelligence (AI)

- Ethical concerns- With popularization of a new technology, its virtues are not guaranteed. For instance, the internet made it possible to connect with anyone and get information from anywhere, but also easier for misinformation to spread.
 - o There are real concerns about the potential negative consequences of AI, from deep fakes to nefarious uses of facial recognition technology.
- Data Management- as there is lack of clarity on data flow and data ownership which might result into data colonialism (data generated by developing countries yet not benefitting them).
 - o Further, data collection for feeding AI algorithms has its associated privacy concerns e.g. mass surveillance.
 - o AI could contribute to the forgery of documents, pictures, audio recordings, videos, and online identities which can and will occur with unprecedented ease.
- Biasedness: The algorithms used in artificial intelligence are discrete and, in most cases, trade secrets. They can be biased, for example, in the

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process of self-learning, they can absorb and adopt the stereotypes that exist in society or which are transferred to them by developers and make decisions based on them.

- **Accountability:** If an AI system fails at its assigned task, someone should be made responsible for it. e.g. an anti-terrorism facial recognition program revoked the driver's license of an innocent man when it confused him for another driver. o Similarly, when any AI algorithm takes a decision related to social dimensions, it is crucial is taken on transparent parameters. These AI algorithms can and do make decisions that create significant and serious issues in people's lives.
- **Super-intelligence:** A sufficiently intelligent AI system can redesign itself or can create a better successor system and so on leading to intelligence explosion. It is crucial to ensure this super-intelligence will be good to human kind and that will depend upon its technological capabilities and ethicality.

Challenges in regulating Artificial Intelligence

- **Excessive Regulation-** Since the AI is still in its preliminary stages, some critics believe that, excessively strict regulation is neither necessary nor desirable.
 - o Such a trend might discourage the needed research in the development of this field.
- **Lack of consensus-** among the countries over the mechanisms and tactics in regulation of AI.
- **Conflict of Interests-** There are doubts over how regulators will use AI, which will provide greater certainty for regulated entities. For example, regulators might themselves use AI to identify violations within a massive set of compliance data.
- **Absence of widespread expertise in AI technologies-** This could lead to policy decisions

being taken based on a narrow spectrum of opinions o There are large gaps in data collection, preparation, and benchmarking capabilities. • **Lack of Predictability:** The algorithms taking over social functions must be predictable to those they govern. The local, specific behavior of the AI may not be predictable apart from its safety, even if the programmers do everything right.

Way Forward

- International agencies could be guided by the Asilomar AI Principles (by Future of Life Institute, a non-profit organization) which are 23 guidelines for the research and development of AI.
- **Need for a responsible AI- Resolutions can be brought to regulate Robotics, and code of ethical conducts can be brought for Robotic engineers, as well as Research ethics committees.** Following set of ethical principles could be adopted like-
 - o Minimize Biasedness and arrest inequalities and discrimination arising out of it
 - o Robots should act in the best interests of humans.
 - o Human interactions with robots should be voluntary.
 - o Ensuring equitable benefits to all
- AI systems should be made legally liable for their actions through making their programmers and users accountable.
- Regulation must be continuous and adapt with evolution of technology.
- There is need to find country specific data, trained workforce, fine-tuned algorithms and technology suited to local needs.

Various steps taken towards regulation of AI

- **OECD Principles on Artificial Intelligence** - adopted by 42 countries including OECD members and non-members. • **United States' AI strategy-** has so far been led by corporations such as Google and Microsoft, who are focusing on self-regulation and rapid technological development.

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o Google- published their own AI principles to help guide ethical development and use of the technology.

o Also in January, 2020 the US has issued broader set of draft principles for federal agencies' treatment of artificial intelligence.

- European Union - The Communication on Artificial Intelligence document which among other issues, outlines the need to have an ethical and legal framework in place.
- China- launched its New Generation AI Development Plan and currently soliciting submissions from AI experts to develop its own governance principles.
- United Kingdom- has developed the Centre for Data Ethics and Innovation, and the Office for AI. Status of India in this regard-
- National Strategy for Artificial Intelligence- NITI Aayog has identified five areas where AI can be useful. It has noted the lack of regulation around AI as a major weakness for India.
- Center of Excellence in Artificial Intelligence (CoE in AI) by National Informatics Centre (NIC) which is a platform for innovative new solutions in AI space, a gateway to test and develop solutions for projects undertaken by NIC at central and state level.

4) Accretion Burst Event

What is it?

Astronomers have recently found that the funnelling of matter into a forming star happens at different rates over time, as per the rotating disc of gas and dust theory. Sometimes the forming star swallows up a huge amount of matter, resulting in a burst of activities in the massive star. This is called an accretion burst event. It is incredibly rare: only three such events have been observed,

out of all the billions of massive stars in the Milky Way.

Need for these understandings: Astronomers don't yet fully understand how massive stars in our galaxy are formed. So far, observations have only yielded some pieces of the puzzle. This is because nearly all the known massive stars in our galaxy are located very far away from our solar system. They also form in close proximity to other massive stars, making it difficult to study the environment where they take shape. So, rotating disc theory helps in understanding these events. With this, the astronomers will be able to develop and test theories to explain how high-mass stars gain their mass.

Maser Monitoring Organisation (M2O): After the first detection of an accretion burst, in 2016, astronomers from around the world agreed in 2017 to coordinate their efforts to observe more. This led to the formation of the Maser Monitoring Organisation (M2O). The primary goal of M2O is to make the astronomy community aware of the importance of Maser monitoring. It is also to increase the number of sources monitored, the number of transitions monitored at, and increase cadence of observation.

What is a Maser?

A maser is the microwave (radio frequency) equivalent of laser. The word stands for "microwave amplification by stimulated emission of radiation".

- Masers are observed using radio telescopes and most of them are observed at centimetre wavelength: they are very compact.
- A maser flare can be a sign of an extraordinary event such as the formation of a star.

5) EAO (East Asian Observatory)

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India is in preliminary discussions to be a part of the East Asian Observatories Consortium of eight countries committed to build large telescopes and pool resources.

About EAO (East Asian Observatory):

Formed by EACOA (East Asian Core Observatories Association) for the purpose of pursuing joint projects in astronomy within the East Asian region.

- The intention of EAO is to build and operate facilities, which will enhance and leverage existing and planned regional facilities.
- It will also raise funding and to build an observatory staff, separate from that of the EACOA institutions.
- The EAO is chartered as a non-profit Hawaii corporation.
- Its first task is to assume the operation of the James Clerk Maxwell Submillimetre Telescope (JCMT) on the summit of Maunakea, Hawai'i.
- It consists of China, Japan, Taiwan, Korea as full members and Thailand, Vietnam, Malaysia and Indonesia as 'observers'.

Implications for India: Having India join the group could mean the establishment of new kinds of telescopes — one proposed being in Tibet — that could aid the observation of new black holes and throw light on cosmic phenomena.

6) Artemis Mission

NASA announces graduating class of 11 astronauts for upcoming space missions including the Artemis Mission. The team includes an Indian American- Raja Chari.

About Artemis:

NASA wants to send the first woman and the next man to the Moon by the year 2024, which it plans on doing through the Artemis lunar exploration program. ARTEMIS stands for Acceleration,

Reconnection, Turbulence and Electrodynamics of Moon's Interaction with the Sun. The mission was named Artemis after the Greek mythological goddess of the Moon and twin sister to Apollo, namesake of the program that sent 12 American astronauts to the Moon between 1969 and 1972.

Objective: The main objective is to measure what happens when the Sun's radiation hits our rocky moon, where there is no magnetic field to protect it.

The mission: For the Artemis program, NASA's new rocket called the Space Launch System (SLS) will send astronauts aboard the Orion spacecraft a quarter of a million miles away from Earth to the lunar orbit. Once astronauts dock Orion at the Gateway — which is a small spaceship in orbit around the moon — the astronauts will be able to live and work around the Moon, and from the spaceship, astronauts will take expeditions to the surface of the Moon.

Lunar missions- key facts:

- Before the US sent the Apollo 11 mission to the Moon, it sent three classes of robotic missions between 1961 and 1968.
- On July 20, 1969, Neil Armstrong became the first human to step on the Moon as part of the Apollo 11 mission.
- After July 1969, 12 American astronauts walked on the surface of the Moon until 1972.
- In 1959, the Soviet Union's uncrewed Luna 1 and 2 became the first rover to visit the Moon. Since then, seven nations have followed suit.
- In the 1990s, the US resumed lunar exploration with robotic missions Clementine and Lunar Prospector.
- In 2009, it began a new series of robotic lunar missions with the launch of the Lunar Reconnaissance Orbiter (LRO) and the Lunar

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Crater Observation and Sensing Satellite (LCROSS).

- In 2011, NASA began the ARTEMIS (Acceleration, Reconnection, Turbulence, and Electrodynamics of the Moon's Interaction with the Sun) mission using a pair of repurposed spacecraft and in 2012 the Gravity Recovery and Interior Laboratory (GRAIL) spacecraft studied the Moon's gravity.

- Apart from the US, the European Space Agency, Japan, China, and India have sent missions to explore the Moon.
- China landed two rovers on the surface, which includes the first-ever landing on the Moon's far side in 2019.

- The Indian Space Research Organisation (ISRO) recently announced India's third lunar mission Chandrayaan-3, which will comprise a lander and a rover.

7) Indian Data Relay Satellite System

India plans to ring in its own era of space-to-space tracking and communication of its space assets this year by putting up a new satellite series called the Indian Data Relay Satellite System.

What is IDRSS? Why it is vital?

The IDRSS is planned to track and be constantly in touch with Indian satellites, in particular those in low-earth orbits which have limited coverage of earth. It will be a set of satellites that will track, send and receive information from other Indian Satellites. IDRSS satellites of the 2,000 kg class would be launched on the GSLV launcher to geostationary orbits around 36,000 km away. A satellite in GEO covers a third of the earth below and three of them can provide total coverage.

Significance: In the coming years, it will be vital to Indian Space Research Organisation (ISRO), whose roadmap is dotted with advanced LEO missions such as space docking, space station, as

well as distant expeditions to moon, Mars and Venus. It will also be useful in monitoring launches. The first beneficiary would be the prospective crew members of the Gaganyaan mission of 2022 who can be fully and continuously in touch with mission control throughout their travel.

8) BLOCKCHAIN TECHNOLOGY

National Informatics Centre (NIC) has set up the Centre of Excellence (CoE) in Blockchain Technology in Bengaluru, Karnataka.

- It aims to provide Blockchain as a service and allowing all stakeholders to benefit from shared learning, experiences and resources.

- It will facilitate the Government Departments in building proof of concepts for use of Blockchain technology in different dimensions of governance leading to large scale deployment of some such applications.

- New and previously unforeseen applications of Blockchain in the Government are expected to enhance transparency, traceability and trust in e-governance systems.

About Blockchain technology

- A blockchain is a specific type of data structure which can be used to transact across nodes or participants. The ownership rights are recorded in cryptographically stored and linked blocks which contain records of ownership of assets among the participants that can remain anonymous.

- Blockchains are open, distributed ledger that can chronologically record transactions between two parties efficiently in near real time.

- The prerequisite for each subsequent transaction to be added to the ledger is the respective consensus of the network participants (called nodes), thereby creating a continuous mechanism

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of control regarding manipulation, errors, and data quality.

- The blockchain technology generally has key characteristics of decentralization, persistency, anonymity and auditability. With these traits, blockchain can greatly save the cost and improve the efficiency. Applications of Blockchain

- Banking- For efficient banking operations and efficiently using the KYC procedures offered by this technology. For instance-

- o SBI leads as the first bank to use KYC and facilitate remittances based on blockchain.

- o Yes Bank adopted this technology to fully digitise vendor financing for one of its clients which enables timely processing of vendor payments without physical documents and manual intervention while tracking the status of transactions in real time.

- o Cross border remittances can be made faster and less costly.

- Capital Markets- in the areas of-

- o Trade Settlement- Faster transfer of securities and payments and reduced trading cost by removing intermediaries

- o Commercial Papers Issuance and Trading- Smart contract based issuance and allocation of Commercial paper to investors, settlement of delivery and payments

- Cybersecurity- Sensitive data moved to the blockchain can effectively manage access by minimizing the risk of leaks to hackers. For instance-

- o The Block Armour solution is the company which ring-fences an organization's critical resources, securely providing access to authorized users and devices.

- Healthcare and pharmaceuticals- It involves a lot of sensitive clinical data which demands a secure and reliable system. For instance-

- o Kare4u Healthcare Solutions has partnered with hospitals, insurance companies and patients to implement its Blockchain-enabled mobile platform "HealthPro" to connect hospitals, insurance companies and host medical records of patients.

- Agriculture- The food supply chain is one characterized by asymmetry of information. The complex network comprises farmers, brokers, distributors, processors, retailers, regulators and consumers.

- o Improved data sharing will result in stakeholders getting their dues (particularly poor farmers with small land holdings) and consumers having control on food quality.

- o Last year Coffee Board had launched the Coffee Blockchain initiative. Under it, country's first blockchain-based marketplace app for trading in Indian coffee was launched which aimed at getting growers better returns by removing middlemen.

- Telecom- to eliminate spam calls and financial fraud by unregistered telecom marketers and open up new revenue streams for the telecom companies etc. For instance-

- o Tech Mahindra has partnered with Microsoft and their Blockchain Solution enables customer's preference registration, consent acquisition, dynamic preference setting, stakeholder onboarding etc.

- Governance- Digital identities, maintaining digital certificates of citizens from birth to death and that of different types of asset ownership, electronic voting, educational certificates, monitoring welfare programs, tracking procurement of all key products and services across Government departments, protecting patents, copyrights and trademarks, confidential access and tracking of health records of all

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citizens, cybersecurity of critical infrastructure are some of the key applications of Blockchain technology

o E.g. Andhra Pradesh has piloted two projects on managing land records and streamlining vehicle registrations. West Bengal has implemented Blockchain based issuance of Birth certificates to newborn. o NITI Aayog is building a platform called 'IndiaChain' — a shared, India-specific blockchain infrastructure to leverage the trinity of Jan-Dhan-Yojana, Aadhaar and the mobile.

✓ It will transform the functionality of public administration using blockchain for efficient and transparent distribution of government subsidies, streamlined record-keeping, systematic tax monitoring, and regulated supply chain management.

✓ The project also has plans to step into the education sector to curb fraudulent degrees and certifications, and seamlessly manage massive amounts of data in the pharmaceuticals and healthcare industry.

• Insurance sector- Inherent inefficiencies in the claim management system of the Insurance Industry lead to losses of about Rs. 10,000 crores per year. Implementing blockchain for claim management is the ultimate solution to mitigate these issues. For instance- o e.g. Cognizant has partnered with insurance providers such as ICICI Prudential Life Insurance, SBI Life Insurance, HDFC Life, Kotak Life and more to develop a secure data-sharing solution built on blockchain platform.

• Blockchain-powered smart contracts where every piece of information is recorded in a traceable and irreversible manner would enhance ease of doing business, augment the credibility, accuracy and efficiency of a contract and reduce the risk of frauds substantially.

• Real Estate- Property deals, which are still carried out on paper making them prone to disputes, can be benefitted through in-built transparency, traceability and efficiency in this system. o Blockchain solves these issues by digitizing land titles, therefore, each land would have a digital address stored on the blockchain with details of occupancy, ownership records, finance, specifications of the property and associated legal disputes. **Challenges in Adoption of Blockchain Technology**

• Lack of Scalability can put a strain on the adoption process, especially for public blockchains. The processing speed is way less than the traditional transaction networks. E.g. Visa can process more than 2000 transactions per second. In contrast, Bitcoin blockchain can process 3-7 transactions per second, and Ethereum can handle approximately 20 transactions in a second.

• Lack of interoperability- Most of the blockchains present in the market work in silos. With so many different networks and approaches, the blockchain space is in a state of confusion with no clear approach and a lack of standards do not allow different networks to communicate with each other.

• Data Portability- As with other record keeping systems, once data is logged in one system, transferring that data to a new system may be problematic.

• Regulation- Some technologies like the permissionless Bitcoin Blockchain bypass regulation completely to tackle inefficiencies in conventional intermediated payment networks. Another challenge of the Blockchain approach is that it reduces oversight. India is yet to implement clearly defined regulations on blockchain technology.

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- Lack of awareness, high cost and limited availability of skilled workforce is also a major impediment in the development of blockchain technology.

- 51% attack: It refers to malicious users or a group of users taking control of more than 50% of the network's mining power. This enables them to recreate the blockchain, thereby altering previous transactions and broadcasting to blockchain users that the attacker's chain is valid. As it would be the longest chain, other users may automatically accept it, even though it was illegitimate.

Government Steps

- Ministry of Electronics and Information Technology (MeitY) has supported a multi institutional project titled Distributed Centre of Excellence in Blockchain Technology with C-DAC, IDRBT and VJTI as executing agencies.

Objectives of this initiative are

- o Evolving an ecosystem around R&D organizations, Government departments and Academia to foster Blockchain technology
- o Design, development and pilot deployment / prototyping of Blockchain based applications in the domains of Governance, Banking & Finance and Cyber Security
- o Conduct research to address the issues and challenges related to Blockchain usage in identified application domains
- o Evolving Blockchain framework using open-source implementations to suite the identified application domain requirements
- o Capacity building in Blockchain technology.
- Ministry of Skill Development and Entrepreneurship (MSDE) in partnership with NASSCOM has launched FutureSkills platform. It focuses on 10 emerging technologies including Blockchain, Artificial Intelligence, etc.

- Department of Science and Technology has launched National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). It has a roadmap to develop Blockchain, AI, Internet of Things, Big Data Analytics, Robotics etc.

Conclusion

Although blockchain is in its infancy, India is pacing towards its adoption and inclusion. Implementing this technology across all spheres of business will certainly prove to be a game-changer despite the roadblocks in its adoption.

9) 2019 NOVEL CORONAVIRUS (2019-NCOV)

Recently, Coronavirus was declared global health emergency by WHO. World Health Organization (WHO) declared COVID-19 an official name for coronavirus disease.

- According to WHO the current outbreak of novel coronavirus (2019-nCoV) was first reported from Wuhan, China, on 31 December 2019.
- On January 30, 2020, the International Health Regulations Emergency Committee of the World Health Organization declared the outbreak a "public health emergency of international concern (PHEIC)".
- o Declaring a global health emergency gives the director general of the WHO the power to offer recommendations that could prevent the spread of a disease, like travel advisories or restrictions, and allow them to review public health measures in place in affected countries.
- o The announcement also imposes more disease-reporting requirements on countries.
- This is the sixth declared global health emergency in the past decade. Other five are H1 virus that caused an influenza pandemic (2009), West Africa's Ebola outbreak (2013-2016), polio (2014), Zika virus (2016), and the ongoing Ebola

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outbreak in the Democratic Republic of Congo (2019).

About Novel Coronavirus

- Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV).

- o A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans.

- o The genome structure of the virus which is spreading in China is 70 per cent similar to Severe Acute Respiratory Syndrome (SARS).

- These viruses consist of a core of genetic material surrounded by an envelope with protein spikes, which gives it an appearance of a crown (Latin: corona).

- Coronaviruses are zoonotic, meaning they are transmitted between animals and people.

- Symptoms: Common signs of infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death.

- Mode of transmission: It is believed that the viruses transmit using secreted fluid from the respiratory system. Coronaviruses can spread through coughing and sneezing without covering the mouth, touching or shaking hands, making contact with a surface or object that has the virus etc.

- o On rare occasions, a coronavirus may spread through contact with faeces.

- Diagnosis: The infection can be diagnosed by PCR Test (Polymerase chain reaction). This test identifies the virus based on its genetic fingerprint.

- Treatment: At present, there is no specific treatment for the new virus, and no vaccine is available to prevent it.

- Impact of Coronavirus outbreak:

- o Economic impact: The Coronavirus outbreak has resulted in closures of multiple air, rail and road routes, as well as production cuts and temporary closures of manufacturing plants, which are expected to shave-off billions of dollars from China's GDP.

- o Supply Chains are Under Stress: It is disruption to global supply chains that poses the greatest threat to markets. The technology, electronics and auto sectors are the most vulnerable to impacts from Coronavirus.
- o Aviation Industry: Several countries like US, Australia, New Zealand, Indonesia, Maldives, and Japan etc. have imposed Travel restrictions on Chinese tourists and visitors and have cut direct transportation links with China.

Coronavirus and India

- India's first novel coronavirus (nCoV) infection confirmed in Kerala. Kerala declared coronavirus as 'State Calamity', which later it withdrew.

- A High-level Group of Ministers has been constituted on directions of Prime Minister to review management of Novel Coronavirus.

- India evacuated its citizens from the coronavirus-hit Hubei province and its capital Wuhan.

- Travel Advisory issued informing the public to refrain from travel to China and that anyone with travel history in China since 15th January 2020 could be quarantined.

How Kerala is Tackling Coronavirus?

To tackle the challenge, the state health department has used its past experience in managing the Nipah outbreak.

Steps taken by Kerala Government are:

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- Health department set up a state-level control room and a rapid response team which were directly linked to the 14 district medical offices.
- Isolation units were prepared in all the six medical colleges and 14 district government hospitals.
- Kerala health officials deployed at airports to screen passengers for the symptoms of deadly virus.
- Government is using the mainstream media and social media to spread awareness among the people about the threat posed by the coronavirus in the thickly populated state.

10) Polycrack technology

The country's first Government-owned Waste-to-Energy Plant was recently commissioned at the Mancheswar Carriage Repair Workshop in Odisha. The plant, a patented technology called Polycrack, is first-of-its-kind in the Indian Railways and fourth in the country. It converts multiple feed stocks into hydrocarbon liquid fuels, gas, carbon and water.

What is Polycrack?

It is the world's very first patented heterogeneous catalytic process which converts multiple feedstocks into hydrocarbon liquid fuels, gas, carbon as well as water.

- The waste generated will become the feeder material for the waste to energy plant.
- The energy which will be produced at the plant, will be in the form of light diesel oil and this oil will be used to light furnaces.

The plant, having a capacity of 500 kg per batch can be fed with the following:

- All kinds of existing plastic
- Petroleum sludge
- Un segregated MSW with moisture up to 50 per cent

- E-waste
- Automobile fluff
- Organic waste including bamboo, garden waste
- Jathropa fruit and palm bunch

Some of the advantages of this plant are as follows:

- The pre-segregation of waste is not required for processing in the plant. The waste as collected from the source, can be directly fed into the polycrack plant.
- The plant has high tolerance to moisture hence drying of the waste after treatment, is not required.
- The waste is processed in the plant and reformed within a period of 24 hours
- The biological decomposition is not allowed as the waste is treated in the plant as it is received
- All the constituents are converted to valuable energy therefore, making it a zero-discharge process through the plant
- The gas generated in the process of the plant is reused in order to provide energy to the system, hence making it self-reliant and self-sufficient for its energy requirements. This also brings down the operating cost of the plant.
- The plant does not cause atmospheric emission during the process unlike the other conventional methods except for the combustion of gases which have pollutants less than the prescribed norms across the world.

11) Laser Interferometer Gravitational Wave Observatory (LIGO) project

An international team led by LIGO-Virgo scientists has identified another event of gravitational ripples from a collision of two neutron stars, making it the second time this type of occurrence has ever been observed in gravitational waves.

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Background: In August 2017, the first observation of gravitational ripples from a neutron star collision made history for being the first time that both gravitational waves and light were detected from the same cosmic occurrence.

What is LIGO?

It is a massive observatory for detecting cosmic gravitational waves and for carrying out experiments. The objective is to use gravitational-wave observations in astronomical studies. The project operates three gravitational-wave (GW) detectors. Two are at Hanford, Washington, northwestern US, and one is at Livingston in Louisiana, south-eastern US. The proposed LIGO India project aims to move one advanced LIGO detector from Hanford to India.

About LIGO- India project: It is piloted by Department of Atomic Energy (DAE) and Department of Science and Technology (DST). The LIGO-India project will be jointly coordinated and executed by three Indian research institutions: the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune and Department of Atomic Energy organisations: Institute for Plasma Research (IPR), Gandhinagar and the Raja Ramanna Centre for Advanced Technology (RRCAT), Indore.

Benefits for India:

1. The project will bring unprecedented opportunities for scientists and engineers to dig deeper into the realm of gravitational wave and take global leadership in this new astronomical frontier.
2. The LIGO-India project will also bring considerable opportunities in cutting-edge technology for the Indian industry which will be engaged in the construction of the eight-km long beam tube at ultra-high vacuum on a levelled terrain.

3. With its establishment, India will join the global network of gravitational wave detectors.
4. Establishing an observatory in India also assumes importance because the further the distance between the observatories, the greater will be the accuracy in locating gravity waves.

12) World's most efficient lithium sulphur battery developed in Australia

Researchers at the University of Monash in Australia have managed to create a super-capacity prototype by re-engineering a Lithium Sulphur (Li-S) battery.

Is it new?

Li-S batteries are not new. But they had an intrinsic problem with the sulphur electrode, which would break after repeated charge cycles, making its superior capacity redundant. The sulphur cathode would break because of expansion and contraction during cycles.

How was this problem overcome?

- To overcome this problem, the researchers gave the electrodes more space to expand and contract. The electrodes are bound inside the battery using polymers. The research team used lesser quantity of these adhesives so that the electrodes had more spaceout structures inside them.
- These structures behaved more like bridges between the sulphur particles rather than a dense network, which stopped the electrodes from disintegrating.

How it works?

The lithium-sulphur batteries operate in the same way as regular lithium-ion work- lithium ions flow between electrodes producing power while not being chemically changed. Charging a battery involves those ions being returned to their starting positions for the process to begin anew.

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Significance: This battery that has five times the capacity of a traditional lithium ion battery. It can retain 99 per cent of its charge even after 200 charge cycles. Li-S batteries are also many times cheaper than lithium ion batteries that could bring down the cost of electric mobility.

13) Scientific Social Responsibility (SSR) Policy

Centre is in advanced stages of preparing a policy on implementing scientific social responsibility (SSR). The draft has already been released.

About SSR Policy:

India is going to be possibly the first country in the world to implement a Scientific Social Responsibility (SSR) Policy on the lines of Corporate Social Responsibility (CSR). A draft of the new policy was recently made available by the Department of Science and Technology (DST).

Aims:

1. To encourage science and technology (S&T) institutions and individual scientists in the country to proactively engage in science outreach activities to connect science with the society.
2. To harness latent potential of the scientific community for strengthening linkages between science and society, and for making S&T ecosystem vibrant.
3. To develop a mechanism for ensuring access to scientific knowledge, transferring benefits of science to meet societal needs, promoting collaborations to identify problems and develop solutions.

Highlights of the Draft:

1. Under the proposed policy, individual scientists or knowledge workers will be required to devote at least 10 person-days of SSR per year for exchanging scientific knowledge to society.

2. It also recognises the need to provide incentives for outreach activities with necessary budgetary support.

3. It has also been proposed to give credit to knowledge workers/scientists for individual SSR activities in their annual performance appraisal and evaluation.

4. No institution would be allowed to outsource or sub-contract their SSR activities and projects.

5. The draft defines SSR as “the ethical obligation of knowledge workers in all fields of science and technology to voluntarily contribute their knowledge and resources to the widest spectrum of stakeholders in society, in a spirit of service and conscious reciprocity”.

6. A central agency will be established at DST to implement the SSR. Other ministries would also be encouraged to make their own plans to implement SSR as per their mandate.

Need for SSR:

When most research is being done by using taxpayers' money, the scientific establishment has an ethical obligation of “giving back” to the society. SSR is not only about scientific impact upon society but also about the social impact upon science. SSR would therefore strengthen the knowledge ecosystem and bring efficiencies in harnessing science for the benefit of society.

14) DRONE REGULATION

Ministry of Civil Aviation announced a scheme providing a window up to January 31, 2020 for voluntary registration of all drones and their operators.

- On successful submission of voluntary disclosure of possessing drone, a Drone Acknowledgement Number (DAN) and an Ownership Acknowledgement Number (OAN)

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will be issued online which will help in validation of operation of drones in India.

- However, the DAN and the OAN do not confer any right to operate drones in India if it does not fulfil the DGCA's drone regulations.
- Further, ownership of drones in India without a valid DAN or OAN shall invite penal action as per applicable laws.

Drones in India

• As per Ministry of Civil Aviation, drones are defined as a technology platform that has wide-ranging application from photography to agriculture, from infrastructure asset management to insurance.

- Drones range in size from very small and those that can carry multiple-kilograms of payload. The DGCA has defined five different categories of drones:
 - o Nano: Less than or equal to 250 grams
 - o Micro: From 250 grams to 2kg
 - o Small: From 2kg to 25kg
 - o Medium: From 25kg to 150kg
 - o Large: Greater than 150kg

• The industry value of unmanned aircraft systems (UAS) in India is projected to touch \$885.7 million by 2021, while the global market size is expected to reach \$21.47 billion.

• However, the number of illegal drones in India is likely to be between 50,000 and 60,000, as on October 2019 which requires a regulation of drones in India.

Drone Regulation in India

- In August 2018, the Centre came up with the first set of norms Drone Regulations 1.0 which are intended to enable visual line-of-sight daytime-only and a maximum of 400 ft altitude operations of Drones.
- Under these guidelines, air space has been partitioned into:
 - o Red zone denotes "no fly zone" (include airspace around airports; near

international border, Vijay Chowk in Delhi; State Secretariat Complex in State Capitals, strategic locations/vital and military installations; etc.)

- o Yellow zone is controlled airspace which signifies airspace requiring Air Defence Clearance or Air Traffic Control clearance.
- o Green zone signifies unrestricted airspace zones. However, even for the Green zone, there is a need to get clearance from the Digital Sky Platform.

- Under these regulations, a process has been prescribed for drone operators to obtain Unique Identification Number (UIN), Unmanned Aircraft Operator Permit (UAOP) and other permissions.

- Currently, India has a 'No Permission-No Take off' (NPNT) clause, which implies that a drone cannot be operated in Indian skies unless the regulatory permission is received through the Digital Sky Platform.

- o Users will be required to do a one-time registration of their drones, pilots and owners. For every flight (exempted for the nano category), users will be required to ask for permission to fly on a mobile app and an automated process permits or denies the request instantly.

- The pilot also needs certification, requiring a remote pilot licence before operating a drone.

- In January 2019, a white paper on drone policy 2.0 was released, that paved the way for wider application of drones, such as the delivery of goods beyond visual line of sight (BVLOS).

- Foreigners are currently not allowed to fly drones in India. For commercial purpose, they need to lease the drone to an Indian entity who in turn will obtain Unique Identification Number (UIN) and UAOP from DGCA.

Need for drone regulations

- For leveraging drone's potential for commercial operations: It will foster various new forms of air freight capabilities, allowing transport of

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temperature and time sensitive commodities like bodily organs, lifesaving medicines etc.

o They can also be used to discharge materials for supplementing agricultural irrigation, survey landscapes, actively monitor rail/road traffic, or survey/inspect agricultural land.

• Security imperatives: A well-articulated drone policy is required, given the new risks and the potential that it has to jeopardise the overall safety environment, including that of the aviation sector.

o Drone Weaponization: Without proper regulation of the commercial drone market, drone weaponization could be added to our growing list of cyber threats and could result in concerns for public safety.

o Recent global attacks such as, on Saudi Arabian refineries and killing of Iran's top military commander are few such instances.

• Privacy concerns: In this day and age of social media and constant digital communication, drones' imaging capabilities pose a bigger threat as they can be used to breach privacy by blackmailing people or capturing unwanted surveillance.

• For boosting Drone startup ecosystem: The drones/UAVs are still considered as an emerging technology and currently, just about 40 drone startups are active in India.

o A robust drone industry by start-ups and manufacturers alike has the power to help India leapfrog innovation cycles in aviation.

Conclusion

While India has crafted a world leading drone policy framework, formalizing the use of drones will need synchronised efforts of policy makers and industry for practical and secure implementation across the country.

About Digital Sky Platform

• It is a software-based self-enforcement unmanned traffic management (UTM) system which is expected to facilitate registration and licensing of drones and operators in addition to giving instant (online) clearances to operators for every flight.

• The Platform regulates all drones in the micro and higher categories.

• It allows operators to apply for a Unique Identification Number (UIN), that needs to be issued for all drones and Unmanned Aircraft Operator Permit online for approval by the civil aviation regulator. About Unmanned Aircraft Operator Permit (UAOP)

• UAOP is a permit required by the owners of the drones to fly them which can be obtained from the Director General of Civil Aviation.

• These UAOPs are not transferrable and shall be applicable for not more than five years.

India's Draft Drone Policy 2.0 (Released in 2019)

• New forms of air freight permitted: It recommends expanding operations to beyond VLOS and beyond the current limit of 400 feet.

• Drone corridors: The policy conceives of drone corridors to keep commercial UAS operations out of non-segregated airspace in which manned aircraft operate.

o Additionally, designated areas known as 'Droneports' to facilitate the landing and take-off of drones.

• Life cycle for drones: Proposes maximum life cycle for drones to ensure airworthiness and operators must apply for re-certification at the end of a drone's life cycle.

• Drone Directorate: Recommends establishing a Drone Directorate within the Directorate General of Civil Aviation (DGCA).

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- DigitalSky service providers (DSPs): It introduces new players DSPs which would be public or private agencies registered in India.
- Permissible Night-time Operations: Permissions and other necessary requirements to be obtained to enable night-time drone flights.
- FDI: It proposes 100% FDI under automatic route in UAS and RPASbased commercial civil aviation services. Under Drone Policy 1.0, there is no mention of FDI.

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