SCIENCE AND TECHNOLOGY

Context: The Global Positioning system

In News, why?

One of the few commonplace technologies that has had such a profound effect on urban, military, scientific, and civilian domains is the Global Positioning System (GPS), which has redefined our sense of location and affected numerous industries worldwide Positioning System, Achievements of Indians in Science & Technology

The Global Positioning System: What Is It?

About:

- The GPS was established in 1973 by the Department of Defence in the United States and consists of three primary segments:

Area:

- 24 satellites in six orbits that make up the space segment provide worldwide coverage, enabling receivers to simultaneously receive signals from at least four satellites—a basic requirement for precise positioning.
- Each of the six orbits has four satellites at all times, and they are all positioned 20,200 kilometers above Earth. Every satellite spends a day completing two orbits.

Control:

- Under the direction of ground-based stations, the control segment maintains the 2020 Standard Positioning Service (SPS) standards while guaranteeing satellite performance and signal accuracy. Globally, key stations oversee and maintain the integrity of the system.
- Users and application developers worldwide might expect different features from the GPS system thanks to the SPS standard.

USER

- The user segment is made up of several industries, ranging from agriculture to military activities. It is estimated that there will be 6.5 billion GNSS (Global Navigation Satellite System) devices globally in 2021, and this number is projected to rise to 10 billion by 2031, demonstrating the pervasiveness of this technology.

GPS functionality

- GPS receivers receive and triangulate radio signals provided by satellites at certain frequencies (L1 and L2 frequencies at 50 bits/second), which allow for precise location determination in three dimensions of space and one dimension of time

Accuracy and Modifications:

- GPS computations are extremely precise because error corrections, such as relativistic effects on satellite clocks and relative velocities, are taken into account to improve accuracy.
- Atomic clocks are used by satellites to keep exact time for GPS. These clocks are essential because minute timing discrepancies have the potential to create significant location inaccuracies.

Are There GNSS in Other Countries?

- In addition to the GPS, a number of nations run their own Global Navigation Satellite Systems (GNSS). Australia, China, the European Union (EU), India, Japan, South Korea, Russia, and the United Kingdom now run these kinds of systems.
- Global systems include China's BeiDou, the EU's Galileo, and Russia's GLONASS.
- In 2006, the Indian government proposed the Indian Regional Navigation Satellite System, which was subsequently renamed as Navigation with Indian Constellation (NavIC). Seven satellites make up its space segment, three of which are in geostationary orbit and four of which are in geosynchronous orbit.
- By May 2023, four satellites at the very least could help with ground-based navigation. The master control facilities are situated in Bhopal, Madhya Pradesh, and Hassan, Karnataka.
- Newer satellites also communicate in the L1 band. The NavIC satellites employ rubidium atomic clocks to send data in the L5 and S bands.
- The Indian Space Research Organization (ISRO) and the Airports Authority of India created and constructed the GPS-Aided Geo Augmented Navigation (GAGAN) system, which is also operated by India.
- "Safety-of-life civil aviation applications catering to the Indian airspace" and "correction and integrity messages for GPS" are GAGAN's main goals.

Conclusion:

GPS is a very useful tool. It is used during adventures.GPS devices are perfect for water navigation , though it has some limitations it does not consider as a big error as these errors are only nano errors.GPS is the most advanced

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accurate commercially available and multi use satellite navigation system that has ever existed. In Military applications it is the only system relied upon in providing Data to very expensive guided weapons

POLITY & GOVERNANCE

Context : Benefits and Challenges Related to Simultaneous Elections Stance of Law Commission on Simultaneous Elections

In News, why?

The Union Government formed a six-member team in September 2023 with the enormous responsibility of investigating the viability of holding simultaneous elections for the Lok Sabha, State assemblies, and local bodies. This was the first step towards electoral reform.

What are Elections Held Simultaneously?

About:

- The concept of simultaneously holding elections for the Lok Sabha, the lower house of Parliament, State legislative assemblies, and local government units like municipalities and panchayats throughout the nation is known as simultaneous elections.
- The purpose behind this notion is to coordinate the election cycles of these many levels of government, with the goal of holding all of the elections at the same time, ideally once every five years.
- India's Past Simultaneous Elections: Elections to the State Assembly and Lok Sabha were held in tandem throughout India's first four general elections.
- Currently, Sikkim, Arunachal Pradesh, Odisha, and Andhra Pradesh assembly elections coincide with Lok Sabha elections.

Advantages of Concurrent Elections:

- **Resource Efficiency:** A substantial amount of money is needed to hold elections at different levels. Election synchronization would combine these costs, saving the government a significant amount of money.
- **Enhanced Administration:** Concurrent elections will simplify the deployment of security personnel and administrative staff, reducing interference from election-related tasks and enabling officials to concentrate more regularly on development and governance.
- **Continuity in Policies**: Since elections would take place at the same time, the Model Code of Conduct would prevent as many disruptions to policy implementation, resulting in more consistent and sustainable government.
- **Increased Voter Turnout**: By reducing the number of elections annually, it may be possible to counteract voter fatigue and boost turnout, which would result in more representative outcomes and greater credibility for elected officials.
- **Enhanced Accountability**: Voters who participate in several levels of government are making politicians answerable for their deeds at multiple levels, which promotes a more extensive accountability framework.
- **Decreased Polarization:** By elevating national problems to the fore and promoting more inclusive campaigning and policy-making, simultaneous elections may lessen the impact of local, caste-based, or communal politics.

Related Difficulties:

Constitutional Amendments:

- A number of the clauses in the constitution must be changed in order to synchronize elections.
- Significant legal obstacles arise from shifting tenure rules, dissolving legislative bodies, and lining up election cycles.
- For instance, the term and dissolution of the Lok Sabha and State Assemblies are governed by Articles 83(2), 85(2), 172(1), and 174(2), which permit premature dissolution under specific conditions and would need to be repealed in order to allow for simultaneous elections.

Federalism Issues:

- The federal structure of India consists of several states with diverse political environments.
- States must come to a broad consensus before moving toward simultaneous elections, even though they may have different political goals.
- Additionally, as local government is a state matter and requires adjustments to a variety of state laws (56 legislative provisions from 28 states' Panchayati Raj Acts and Municipal Acts), there are obstacles to connecting general and local body elections.

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Technology and Infrastructure:

- Purchasing, maintaining, and guaranteeing dependability present difficulties when upgrading large-scale technical infrastructure, such as electronic voting machines (EVMs) and voter-verifiable paper audit trail devices (VVPATs).

Legal Councils and By-elections:

- By-elections and elections to legislative councils might be excluded if all elections were synchronized, potentially creating gaps in representation and governance.

Diverse Political Landscapes:

- The multi-party system in India encompasses a range of regional concerns and political philosophies.
  Elections held at the same time may ignore local concerns and reduce the influence of smaller or local parties.
  What is the Law Commission's position regarding simultaneous elections?
- In August 2018, the Law Commission presented a draft report on simultaneous elections that looked at the difficulties and suggested ways to hold elections in India simultaneously.
  A Suggestioned Structure for Election Timing Harmonization:
- **Cut Down on Election Cycles:** suggests that elections be held twice every five years.
- **Organizing All Elections in a Calendar Year**: In the event that holding elections simultaneously is not practical, suggest organizing all elections to take place during the same calendar year.
- **Constructive Vote of No-Confidence Motion**: Suggested as a substitute for the "no-confidence motion," this motion would guarantee trust in a different administration prior to toppling the current one.
- **Hung House Resolution**: The Hung House Resolution offers a procedure to resolve cases in which no party has enough votes to form a government. It gives the largest party or coalition a chance to try forming a government prior to the midterm elections.
- **Timely Disqualification**: Recommends changing anti-defection legislation to guarantee that disqualification disputes are promptly resolved by the presiding officer within six months.
- The Law Commission and the group entrusted with examining the viability of simultaneous elections met in late October 2023 to talk about the timeline for coordinating assembly and parliamentary elections by 2029

Conclusion

India needs to take a cautious, consensual approach to achieving simultaneous elections, weighing the advantages of simplified governance against the complexity of many regional dynamics. A synchronized electoral process that respects federal structures and increases administrative efficiency can be achieved through small steps, stakeholder engagement, and flexible frameworks.

PRELIM FACTS

1. Seven South Asian countries have at least 241 invasive plant species identified.

Why in news:

241 plants that were brought to south Asian countries over time have been identified by scientists from India and six other nations as Invasive Alien Species (IAS).

Important information:

This is the first attempt to create a comprehensive inventory of South Asia's invasive alien flora.
With 185 of these plant species, India tops the list.

Invasive Alien Species (IAS): What Are They?

- IAS are introduced animals and plants that have a detrimental effect on the native biodiversity, ecosystem services, or public health when they are placed in areas that are not part of their normal range.
- They pose one of the greatest risks to biodiversity and the world's food security. South Asia received the greatest number of invasive plant introductions from: America's South (142) , America's North (66), Africa (42) .

Impact of IAS: Climate change exacerbates the effects of IAS.

- Numerous alien species find it easier to establish themselves and expand, and climate change opens up new avenues for them to become invasive.
- They may lessen the ability of metropolitan communities, agricultural systems, and natural habitats to withstand climate change.
- On the other hand, habitats become less resilient to biological invasions, security, and livelihoods as a result of climate change.

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Specifics of different invasive plants:

- The Asteraceae family of plants is responsible for the majority of invasive species found in the area.
- This family includes plants such as sunflower, marigold, dahlia, dandelion, and lettuce.
- Families like Solanaceae (18) and Fabaceae (36) come next.
- Among invasive species, Acacia is the most abundant genera.
- The family Fabaceae includes the vilayti kikar (Prosopis juliflora), which grows in Delhi.

2**. The Ladakh Green House**

Why in news:

Ladakh developed innovative techniques to grow vegetables under difficult circumstances.

Important information:

- The Union Territory of Ladakh has developed a novel technology called the "Ladakh Green House" to grow vegetables year-round in restricted amounts under carefully regulated conditions.
- This new form of the Ladakh Greenhouse, a passive solar greenhouse, was created by researchers at the Defence Institute of High Altitude Research (DIHAR) for nearby farmers.
- Since Ladakh is a frigid climate, growing crops and vegetables in the winter is difficult because the temperature frequently falls below -20°C.
- Farmers in the area can now cultivate vegetables even during the worst winter months, when temperatures can drop below -30 degrees Celsius, thanks to the adoption of this innovative technology.
- To date, Ladakh has built 1,875 of these greenhouses at an estimated cost of ₹43.78 crore, enabling farmers to cultivate a variety of green leafy vegetables, including tomatoes, cauliflower, and cabbage, during the hard winter months.

3. Google Gemini

Why in news:

- Users worldwide can now access Google Gemini, a new multimodal general artificial intelligence model.

Google Gemini: What is it?

- There are three sizes available for Google Gemini: Ultra, Pro, and Nano.
- It is thought of as Google's response to ChatGPT, which has led the way in GenAI thus far.

ChatGPT

- ChatGPT is an AI chatbot that can translate, create natural language, and respond to queries.
- Generative Pre-trained Transformer is what GPT stands for.
- With 175 billion parameters, GPT-3 was the largest language model in use at the time of its debut in 2020.
- GPT-4, the most recent version, has one trillion parameters and may be accessed via ChatGPT Plus or Bing Chat.
- Due to Gemini's multimodal nature, it can comprehend, process, and function with text, code, audio, images, and video among other types of data.
- Conversely, ChatGPT is currently unable to function with video.
- Additionally, it has a lot more power than current models.
- Gemini is capable of comprehending, elucidating, and producing top-notch code in the most widely used programming languages worldwide, including Python, Java, C++, and Go.

Why are there three sizes for Gemini?

- Gemini will be offered in several sizes so that it can be scaled to meet requirements.
- The largest and most powerful variant, Gemini Ultra, is designed for extremely complicated tasks.
- Gemini Pro will perform best when scaling for regular users worldwide across a variety of jobs.
- On-device tasks will be handled by Gemini Nano.

1. UN Charter Article 99

Why in news:

- In an attempt to establish a truce, the UN Secretary-General has invoked Article 99 of the UN Charter in response to Israel's continuous military attacks on the Gaza Strip, notably in its southern sector.

About United Nations Charter Article 99:

- The United Nations' foundational document is the UN Charter.
- The UN can act on a wide range of topics based on the authorities granted through it.
- UN Member States are obligated to abide by the Charter because it is regarded as an international treaty.
- According to Article 99, the Secretary-General may bring any issue that he believes could
- It is seen as a discretionary power.

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2. Pompe disease

Why it's news:

After fighting the illness for 24 years, India's first patient with Pompe disease passed away yesterday.

Concerning Pompe Disease:

- Pompe disease, sometimes called Glycogen Storage Disease Type II, is an uncommon hereditary condition brought on by a lack of the enzyme acid alpha-glucosidase (GAA).
- This enzyme is essential for the conversion of glycogen to glucose in cell lysosomes.
- Estimates of its prevalence range from 1 in 40,000 to 1 in 300,000 live births.

Several important symptoms include:

Muscle weakness:

- One of the main symptoms of Pompe illness is progressive muscular weakness.
- It impairs smooth and skeletal muscles, making it difficult to move around and carry out regular tasks.
- Breathing problems can be caused by weakness in the respiratory muscles, particularly when exercising or even just resting down.

Motor skill delay:

- Patients' children may take longer to reach motor milestones like sitting, crawling, and walking.
- There are differences in the degree of motor skill delay, and some people may never reach specific motor milestones**.**

Long-term muscular weakness and decreased mobility can have a degenerative effect on bones, resulting in skeletal abnormalities and joint contractures.

Complications with the respiratory system:

- One possible effect is the weakening of the diaphragm and other breathing muscles.
- Breathlessness, respiratory infections, and, in extreme situations, respiratory failure are possible side effects for patients.

Cardiac participation:

- Complications may arise from Pompe disease-related damage to the cardiac muscles.

Consequences for day-to-day living:

- Because of their breathing restrictions and weak muscles, patients may find it difficult to carry out everyday tasks on their own.
- It could be required to use respiratory support equipment and wheelchairs, among other assistive devices.

Diagnosis:

- The activity of the defective enzyme, acid alpha-glucosidase (GAA), is measured using enzyme assays.
- Genetic testing finds changes in the GAA gene that cause the problem.
- Clinical assessments take the patient's medical history and symptoms into account.

Therapy:

- Although there isn't a cure for Pompe disease at this time, there are treatments that can help patients manage their symptoms and live better.
- The conventional treatment is called Enzyme Replacement Therapy (ERT), which involves infusing the missing enzyme to reduce the accumulation of glycogen.

ANSWER WRITING

Q. What do you understand by "moral integrity" and "professional efficiency" in the context of corporate governance in India? Illustrate with suitable examples.

Introduction:

The term "corporate governance" describes the set of guidelines, procedures, and policies that regulate a company in order to keep it from becoming overly greedy and to make sure that it is run responsibly and openly.

Moral integrity" and "professional efficiency" are two fundamental concepts that direct moral behaviour and conscientious management in Indian business governance.

Moral Integrity:

- Adhering to strong ethical beliefs and principles in company processes is referred to as moral integrity in corporate governance. It entails behaving honorably, openly, fairly, and responsibly in addition to abiding by the law and doing what is ethically correct.
- An example of moral integrity is when a business discloses its financial results truthfully, even if it means admitting a drop in earnings or facing financial difficulties.

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Professional Efficiency:

- In the context of corporate governance, professional efficiency refers to the efficient and accountable administration of a business's assets and activities.
- Process optimization, risk management, and decision-making that balances the interests of all stakeholders with the goal of maximizing value for shareholders are all part of it.
- As an illustration, using the newest technology and digital tools can greatly increase professional effectiveness.

Conclusion

- Businesses that exhibit moral rectitude and competent management are more likely to retain their good name, draw in outside capital, and further India's general social and economic advancement.

MCQs

1. Regarding the phenomenon of Tropical cyclone, consider the following statements:
   1. They only emerged in the areas between the Equator and the Tropic of Cancer.
   2. They typically form over the warm ocean surface in the summertime around the Inter-Tropical Convergence Zone (ITCZ).
   3. They are among the processes that transfer surface thermal energy from the equator to the poles.

   How many of the statements given above is/are correct?
   a) Only one **b) Only two**
   c) All three d) None
2. Examine the following claims on the Asola Bhatti sanctuary:
   1. One of the few remaining sections of the Delhi Ridge hill range is located in this protected area.
   2. It has a great deal of potential for developing programs for nature interpretation and conservation education.

   Which of the statements given above is/are correct?
   a) 1 only b) 2 only
   c) Both 1 and 2 d) Neither 1 nor 2
3. Examine the following claims regarding the United Nations Educational, Scientific, and Cultural Organization (UNESCO):
   1. It is a United Nations (UN) specialized organization.
   2. It is the only UN organization tasked with overseeing every facet of education.

   Which of the statements given above is/are correct?
   a) 1 only b) 2 only
   c) Both 1 and 2 d) Neither 1 nor 2
4. With reference to the Monetary Policy Committee (MPC), consider the following statements:
   1. Its responsibility is to set the benchmark policy rate, or repo rate, needed to keep inflation within the designated target range.
   2. In order to establish a statutory and institutionalized foundation for an MPC, the Indian Constitution has been changed.
   3. Three members will constitute a quorum for a meeting.

   How many of the statements given above is/are correct?
   a) Only one b) Only two
   c) All three d) None
5. "PSR J1032-5804" made headlines recently. It's an
   a) Potentially Hazardous Asteroid
   b) Pulsar
   c) Newly discovered moon of Saturn
   d) Black hole
6. The case of "Cox and Kings vs. SAP Pvt. Ltd." made headlines recently. Which of the following Supreme Court concepts is invoked in this case?
   a) Group of Companies Doctrine
   b) Doctrine of Promissory Estoppel
   c) Doctrine of Lifting the Corporate Veil
   d) Doctrine of Uberrima Fides
7. Recently, 'Gemini model' was in the news. It is associated with
   a) Cloud Computing **b) Artificial Intelligence**
   c) Quantum computing d) Blockchain technology
8. Consider the following statements regarding 'Kopili Fault Zone'
   1. It is a 300 km long and 50 km wide lineament situated near the Himachal Pradesh-Uttarakhand border in India.
   2. It is closer to the Himalayan Frontal Thrust.
   3. This is a seismically active area falling in the highest Seismic Hazard Zone I.

   How many of the statements given above are correct?
   a) Only one b) Only two
   c) All three d) None
9. Which of the following institutions/organizations releases the Global Cooling Watch 2023 report?
   a) UNFCCC, the United Nations Framework Convention on Climate Change
   b) The UNEP, or United Nations Environment Programme
   c) The IPCC, or Intergovernmental Panel on Climate Change
   d) WMO, or the World Meteorological Organization
10. Global Drought Snapshot' report which was recently in news is published by
    (a) **UN Convention to Combat Desertification**
    (b) The Convention on Biological Diversity
    (c) The United Nations Framework Convention on Climate Change
    (d) The United Nations Environment Programme

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