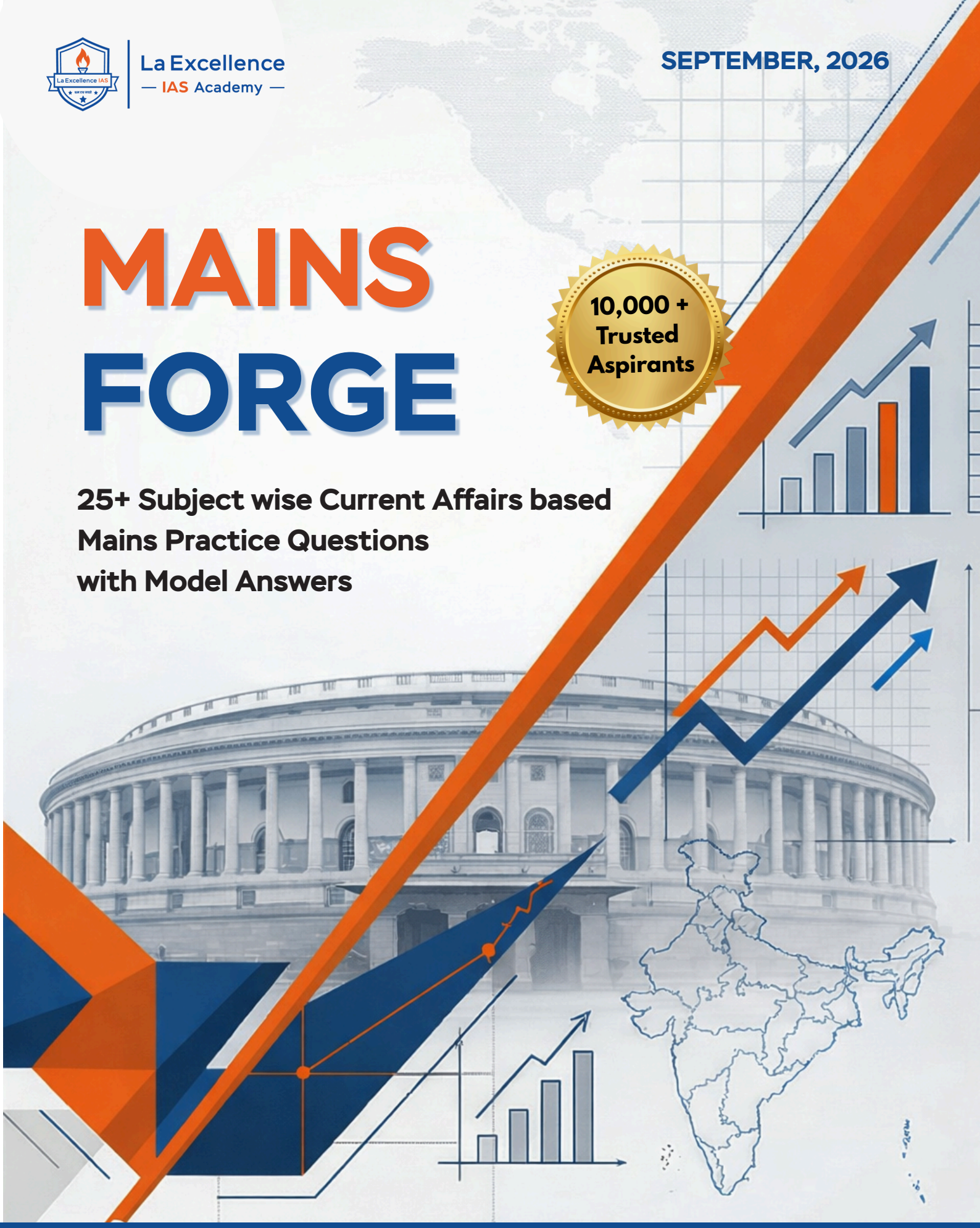
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A. Polity & Governance

1. **"PM SHRI represents a shift from infrastructure-oriented school development to holistic and competency-based education." Discuss with reference to the objectives of the National Education Policy 2020.**

(10 Marks, 150 Words)

Introduction:

Traditional school-development programmes largely measured progress through classrooms, toilets, electricity and enrolment. **PM SHRI**, launched in 2022, retains these essentials but shifts the focus towards the **quality and purpose of education**, thereby operationalising **NEP 2020** at the school level.

Shift towards NEP 2020 objectives:

- **Competency-based learning:** Replaces rote memorisation with conceptual understanding, application, creativity and problem-solving.
- **Learner-centred pedagogy:** Promotes experiential, inquiry-based, play- and activity-based learning within the **5+3+3+4 structure**.
- **Holistic development:** Integrates academics with arts, sports, vocational education, local internships and socio-emotional skills.
- **Equity and multilingualism:** Encourages barrier-free access, support for diverse learners and mother-tongue instruction in early grades.
- **Future readiness:** Uses ICT, smart classrooms, STEM learning and **DIKSHA** to build digital capabilities.
- **Systemic improvement:** Strengthens teachers and school leaders, while exemplar schools mentor neighbouring institutions.

Challenges:

- **Implementation gaps:** Uneven administrative capacity and infrastructure across States may affect uniform implementation.
- **Teacher preparedness:** Teachers require continuous training to effectively adopt competency-based and experiential pedagogies.
- **Digital divide:** Unequal access to devices, internet and digital resources may limit technology-enabled learning.

Way Forward:

- **Strengthen teacher capacity** through continuous professional development and peer-learning networks.
- **Ensure outcome-based monitoring**, focusing on competencies and learning outcomes rather than infrastructure alone.
- **Bridge regional and digital inequalities** through targeted funding, localised solutions and robust digital infrastructure.

Conclusion:

PM SHRI can translate NEP 2020 from policy into classroom practice, provided improvements extend beyond selected schools to strengthen the entire public-education system.

2. Examine the rationale behind demands for special constitutional safeguards for Ladakh. To what extent can provisions on the lines of Article 371 address concerns relating to land, culture, resources and political representation? *(15 marks, 300 words)*

Introduction:

Ladakh became a **Union Territory without a legislature in 2019**. Its distinctive cultural identity, fragile Himalayan ecology and limited elected law-making space have generated demands for stronger constitutional safeguards. The Centre has recently proposed a possible **Article 371K-type arrangement**, though its final form and powers remain under discussion.

Rationale behind the demands:

- **Land protection:** Local groups seek safeguards against unrestricted transfer of land and possible demographic pressures.
- **Culture and identity:** Ladakh has distinctive **languages, customs, religious traditions and tribal communities** that require protection.
- **Ecological vulnerability:** Its cold-desert ecosystem makes decisions on **forests, water, mining, tourism and infrastructure** especially sensitive.
- **Employment:** There are demands for stronger protection of **local employment opportunities**.
- **Political representation:** As a UT without a legislature, Ladakh has limited law-making autonomy, generating demands for a stronger directly elected institution.

How an Article 371-type provision can help?

- Constitutional safeguards can protect **land, culture, language and natural resources**.
- Provisions similar to **Articles 371A and 371G** show how asymmetric arrangements can protect customary practices and region-specific interests.
- The proposed Ladakh framework envisages a **directly elected UT-level body**, potentially with legislative, executive, financial and planning powers over specified subjects.
- Constitutional status can provide greater durability than ordinary administrative safeguards.

Limitations:

- Article 371-type protection would **not automatically amount to statehood or a full-fledged legislature**.
- Its effectiveness would depend on the **subjects transferred, financial autonomy and relationship with the Lieutenant Governor and existing Hill Councils**.

Way Forward:

- Clearly define powers over **land, culture, environment and local development**.
- Ensure adequate **financial devolution and democratic accountability**.
- Harmonise the new body with the **Leh and Kargil Hill Councils**.
- Build safeguards through sustained consultation with local communities while maintaining national and strategic interests.

Conclusion:

A carefully designed Article 371K-type framework can strengthen **asymmetric federalism and democratic participation** in Ladakh. Its success, however, will depend less on the constitutional label and more on the **actual powers, resources and representation** it provides.

B. International Relations

3. Discuss the strategic importance of the Red Sea for India's trade and energy security. (10 Marks, 150 Words)

Introduction:

The Red Sea, connected to the Mediterranean through the **Suez Canal** and the Gulf of Aden through **Bab el-Mandeb**, is a vital maritime corridor linking India with Europe and North Africa.

Importance for trade:



- **Shorter connectivity:** The Suez route reduces sailing distances between Indian ports and European markets compared with the Cape of Good Hope.
- **Supply-chain security:** It facilitates exports of textiles, engineering goods and pharmaceuticals, alongside imports of machinery and intermediate goods.
- **Trade costs:** Disruptions force longer voyages, raising freight charges, insurance premiums and delivery times.

Importance for energy security:

- **Import access:** The corridor facilitates energy shipments from Russia, the Mediterranean and North Africa.
- **Price stability:** Disruptions affect global oil and LNG markets, increasing India's import bill and inflation.
- **Distinct chokepoints:** Much of India's Gulf energy supply uses **Hormuz**, rather than the Red Sea.

Conclusion:

India must strengthen maritime surveillance, naval cooperation and route diversification while supporting regional stability and freedom of navigation.

4. How can India pursue stable relations with China without compromising its territorial integrity and strategic autonomy? Suggest an appropriate way forward. (10 Marks, 150 Words)

Introduction:

India needs stable relations with China for regional peace and development. However, engagement must safeguard sovereignty and preserve independent foreign-policy choices.

Pursuing stability without compromising core interests:

- **Territorial integrity:** Reject unilateral changes along the LAC and maintain credible military preparedness.
- **Strategic autonomy:** Cooperate through BRICS and the SCO while independently strengthening partnerships, including the Quad.
- **Economic security:** Retain beneficial trade while reducing dependence on Chinese critical inputs and protecting sensitive sectors.
- **Reciprocal engagement:** Link broader normalisation to border tranquillity, mutual respect and adherence to agreements.

Way Forward:

- Sustain diplomatic and military dialogue for verified disengagement and de-escalation.
- Improve border infrastructure, clarify LAC perceptions and strengthen crisis communication.
- Diversify supply chains and strengthen domestic manufacturing.
- Expand river-data sharing, climate cooperation and people-to-people exchanges.
- Strengthen neighbourhood partnerships through responsive development cooperation.

Conclusion:

Credible deterrence and sustained dialogue should guide India's approach. Cooperation must rest on reciprocity, ensuring that stability strengthens India's security and freedom of choice.

5. **Diplomacy designed for "normal times" may be inadequate for a world facing unusually serious and interconnected risks. Comment.** *(10 Marks, 150 Words)*

Introduction:

Traditional diplomacy evolved mainly for managing **state-to-state relations, negotiations and conflicts under relatively stable conditions**. Today, however, crises increasingly cross borders, sectors and institutions simultaneously.

Why traditional diplomacy is inadequate?

- **Interconnected crises:** Climate change can trigger food insecurity, migration, conflict and economic instability.
- **Non-state threats:** Cyberattacks, terrorism, pandemics and AI risks involve actors beyond governments.
- **Speed of crises:** Digital technologies and financial markets transmit shocks faster than conventional diplomatic processes can respond.
- **Global commons:** Oceans, cyberspace, outer space and climate require collective rules rather than purely bilateral bargaining.
- **Geopolitical fragmentation:** Strategic rivalry often obstructs cooperation even on shared threats.
- **Supply-chain dependence:** Wars or disasters in one region can disrupt energy, food and critical technologies globally.

Way Forward:

Diplomacy must therefore become **preventive, networked and multi-stakeholder**, combining bilateralism, multilateral institutions, minilateral groupings, scientific expertise and crisis coordination.

Conclusion:

Thus, diplomacy must move from merely **managing relations between states to managing shared global vulnerabilities**.

6. **How can a more stable U.S.–China relationship affects India's strategic and economic interests? Explain.** *(10 Marks, 150 Words)*

A more stable U.S.–China relationship implies **managed strategic competition rather than an end to rivalry**. Greater predictability between the two powers can reshape India's strategic choices, trade opportunities and economic security.

Implications for India:

Strategic:

- **Reduced great-power tensions** can improve stability in the Indo-Pacific and lower risks to global trade.
- However, India cannot assume that U.S.–China rivalry will automatically increase India's strategic importance to Washington.
- Selective U.S.–China cooperation may require India to pursue **strategic autonomy and diversified partnerships**.

Economic:

- Reduced tariff confrontation can stabilise **global markets and supply chains**, benefiting Indian trade.
- Conversely, easing U.S.–China economic tensions may reduce some opportunities arising from **China+1 supply-chain diversification**.
- China's dominance in rare-earth processing highlights India's need to strengthen **critical-mineral and semiconductor supply chains**.
- External tariff measures linked to Russian energy purchases can also affect India's **energy security and exports**.

Conclusion:

India should respond through **strategic autonomy, diversified trade, technological self-reliance and resilient supply chains**, while maintaining productive relations with both powers.

C. Economy

7. Why is the base year of national income estimates revised periodically? Explain how such revision improves the measurement of an evolving economy. (10 Marks, 150 Words)

Introduction:

The **base year** is the reference year whose prices and production structure are used to estimate **real national income or GDP**. It is periodically revised because an old base year may no longer represent the structure, prices and consumption patterns of a changing economy.

Need for Periodic Revision:

- New industries, products and services - such as digital platforms, renewable energy and financial technology - emerge over time, while the importance of older activities may decline.
- Consumption patterns, production technologies, relative prices and the sectoral composition of GDP continuously change.
- Economic surveys, censuses and administrative databases become more comprehensive and reliable.
- A recent normal year is required to avoid distortions caused by inflation, recession, natural disasters or other exceptional events.

How Revision Improves Measurement?

- It updates the **weights assigned to different sectors**, reflecting their current contribution to the economy.
- It incorporates improved data sources, wider enterprise coverage and revised estimation methods.
- It captures previously underrepresented activities, particularly in the **informal and services sectors**.
- Updated price indices help separate changes in output from inflation, producing more accurate **real GDP growth rates**.
- It improves estimates of sectoral growth, productivity, savings and investment, thereby supporting better fiscal and monetary policies.

Conclusion:

Thus, base-year revision is not merely a statistical exercise; it aligns national accounts with contemporary economic realities. However, transparent methodology and comparable back-series data are essential to preserve credibility and enable meaningful comparison over time.

8. What role can Central Bank Digital Currencies play in facilitating cross-border trade settlement among BRICS countries? Explain the technological and regulatory challenges involved. (10 Marks, 150 Words)

Central Bank Digital Currencies (CBDCs) are sovereign digital forms of national currencies issued by central banks. Their interoperability can facilitate faster and more efficient trade settlement among BRICS countries.

Role in cross-border settlement:

- CBDCs can enable near-real-time, direct settlement, reducing dependence on correspondent banks and intermediaries.
- They can lower transaction costs and address time-zone and liquidity-related delays.

- Settlement in domestic currencies may reduce exchange-rate risks and dependence on dominant reserve currencies.
- Programmable payments can automate trade-finance processes through smart contracts.
- A common CBDC platform could enhance financial inclusion, transparency and intra-BRICS trade.

Challenges:

- Different CBDC architectures, technical standards and levels of digital readiness hinder interoperability.
- Cyberattacks, system failures, privacy breaches and risks to transaction data threaten trust.
- Regulatory differences concerning anti-money laundering, capital controls, taxation and data localisation complicate coordination.
- Legal uncertainties arise regarding jurisdiction, settlement finality and dispute resolution.
- Geopolitical mistrust and monetary-sovereignty concerns may obstruct data-sharing and common governance.

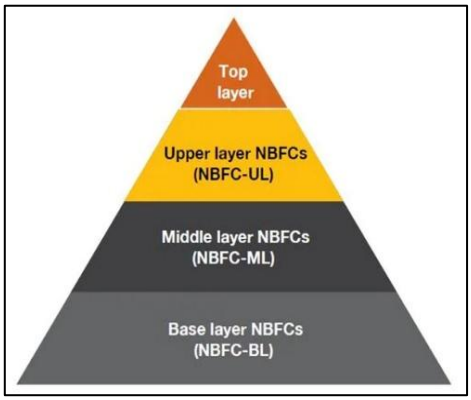
Thus, BRICS requires interoperable standards, robust cybersecurity and a mutually accepted regulatory framework for CBDC-based settlements.

9. What is scale-based regulation of Non-Banking Financial Companies (NBFCs)? Explain why larger financial institutions require stricter regulatory oversight. (15 Marks, 250 Words)

Introduction:

Scale-Based Regulation (SBR) is the RBI's risk-sensitive framework under which regulatory intensity increases with an NBFC's size, activity, complexity, interconnectedness and perceived systemic risk. Effective from October 2022, it replaces a broadly uniform approach with proportionate supervision.

Four-layer regulatory structure:



- **Base Layer:** Non-deposit-taking NBFCs with assets below ₹1,000 crore and specified low-risk entities.
- **Middle Layer:** All deposit-taking NBFCs, non-deposit-taking NBFCs with assets of ₹1,000 crore or more, and entities such as **Housing Finance Companies, Core Investment Companies and Infrastructure Finance Companies.**
- **Upper Layer:** Systemically significant NBFCs identified through RBI's scoring methodology; the ten largest eligible NBFCs by assets are included automatically.
- **Top Layer:** Normally remains empty but may include Upper-Layer entities showing substantially heightened systemic risk.

Why larger institutions require stricter oversight?

- **Systemic contagion:** Their failure can transmit stress to banks, mutual funds, bond markets and group companies.
- **Public exposure:** large deposit, borrowing and customer bases magnify losses and affect confidence.
- **Complexity and opacity:** Multiple subsidiaries, related-party transactions and off-balance-sheet exposures make risk harder to detect.
- **Concentration risk:** Large exposures to particular borrowers or sectors can intensify economic shocks.

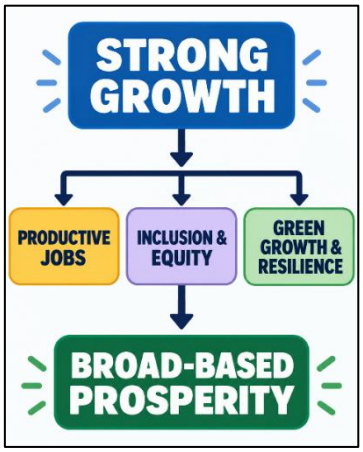
- **Moral hazard:** Expectations of rescue may encourage excessive leverage and risk-taking.
- **Financial stability:** Liquidity mismatches can trigger fire sales and market-wide funding pressures.
- Consequently, Upper-Layer NBFCs face stronger capital, provisioning, governance, disclosure, large-exposure and listing requirements.

Conclusion:
SBR balances innovation and credit delivery with financial stability by imposing lighter compliance on smaller, low-risk NBFCs and bank-like prudential discipline on systemically important institutions.

10. India's recent growth has been supported by strong investment and expansion in manufacturing and services. How can this momentum be used to achieve inclusive and sustainable development?

(10 Marks, 150 Words)

Introduction:
India's investment-led growth and expanding manufacturing and services provide an opportunity to translate economic gains into better livelihoods, wider opportunities and environmental security.



1. Promote inclusive development:
   - **Employment generation:** Promote labour-intensive manufacturing, MSMEs and tourism to create productive jobs.
   - **Human capital:** Align skill training with industry needs while strengthening public education and healthcare.
   - **Social inclusion:** Expand women's workforce participation through childcare, safe transport and equal opportunities.
   - **Regional balance:** Direct infrastructure investment towards backward districts and strengthen rural enterprises and agricultural value chains.
2. Ensure sustainable development:
   - **Green production:** Encourage renewable energy, energy efficiency and cleaner industrial technologies.
   - **Resource conservation:** Promote recycling, wastewater reuse and sustainable land management.
   - **Resilient infrastructure:** Integrate climate risks into urban planning, transport and industrial projects.
   - **Accountable governance:** Link investment incentives to employment creation, environmental compliance and community benefits.

Conclusion:
Growth becomes development when rising output creates dignified livelihoods, reduces inequalities and preserves ecological resources for future generations.

D. Environment, Ecology & Disaster Management

11. E-waste management should be viewed not merely as an environmental obligation but also as an instrument of resource security and industrial policy. Discuss and suggest reforms to India's Extended Producer Responsibility framework. (15 marks, 250 words)

Introduction:

E-waste contains hazardous substances such as lead and mercury, but also valuable copper, lithium, cobalt, gold and palladium. Therefore, its scientific management is simultaneously an **environmental necessity, an urban-mining opportunity and a tool of industrial policy**.

Strategic Significance of E-waste Management:

- **Pollution control:** Formal recycling prevents open burning and acid leaching, which contaminate air, soil and groundwater.
- **Public health:** Scientific handling protects informal workers and nearby communities from toxic exposure.
- **Resource security:** Recovery of critical minerals reduces dependence on imports and exposure to global supply disruptions.
- **Industrial development:** Domestic dismantling, refining and material-recovery facilities can support electronics, batteries and renewable-energy industries.
- **Circular economy:** Repair, refurbishment and recycling extend product life and reduce virgin-material extraction.
- **Employment:** Formalising informal workers can generate skilled **green jobs**.
- **Data security:** Certified recycling enables secure destruction of sensitive data stored in discarded electronic equipment.

Limitations of India's EPR Framework:

Under the **E-Waste (Management) Rules, 2022**, producers must meet recycling targets through registered recyclers and EPR certificates. However:

- Fake or unverifiable certificates weaken traceability.
- Compliance often rewards the cheapest certificate rather than high-quality material recovery.
- Low certificate prices may make scientific recycling commercially unviable.
- Targets emphasise the quantity processed, not the percentage of valuable materials recovered.
- Informal recycling and leakage outside the formal system remain significant.
- India has limited capacity for advanced recovery and domestic refining of precious metals.

Required Reforms:

- Create end-to-end digital tracking based on audited **material mass balances**.
- Link EPR credits to actual recovery efficiency, not merely waste tonnage.
- Fix a transparent floor price reflecting the cost of environmentally compliant recycling.
- Conduct independent audits and impose deterrent penalties for fraudulent certificates.
- Mandate minimum domestic recovery and refining of critical minerals.
- Prioritise repair and refurbishment before recycling.
- Integrate and train informal workers through cooperatives and registered collection centres.
- Use EPR funds to support advanced recycling research and regional infrastructure.

Conclusion:
A credible EPR system must move beyond paper compliance towards measurable resource recovery. This can transform India's e-waste from a toxic liability into a strategic source of minerals, technology and green employment.

12. **"India's urban air-pollution challenge requires airshed-based governance rather than city-specific interventions alone." Discuss with reference to the National Clean Air Programme.** (10 Marks, 150 Words)

Introduction:
An **airshed** is a geographical area sharing a common flow of air and pollutants. Since emissions travel across municipal and State boundaries, urban air pollution cannot be addressed through isolated city-level measures alone.

Need for airshed-based governance:
- Pollution in a city may originate from industries, thermal plants, vehicles, construction activities, waste burning and agricultural fires located outside its jurisdiction.
- Seasonal winds, temperature inversions and regional geography influence the accumulation and transportation of pollutants.
- Fragmented administration may shift pollution from one jurisdiction to another without reducing the overall pollution load.

NCAP and its limitations:
- The **National Clean Air Programme**, launched in 2019, covers 130 cities through source-specific Clean Air Action Plans.
- It promotes monitoring, performance-linked grants and coordination among governments and Urban Local Bodies.
- However, its predominantly city-centric implementation inadequately addresses inter-city and inter-State pollution flows.

Conclusion:
NCAP should adopt scientifically mapped airsheds, common emission inventories, regional targets and empowered inter-State coordination mechanisms, building upon the CAQM model, to secure sustainable improvements in urban air quality.

13. **"The ability to mine the deep ocean does not automatically justify its exploitation." In this context, discuss the need for a precautionary and sustainable approach to deep-sea mining.** (15 marks, 250 words)

Introduction:
Deep-sea mining involves extraction of minerals such as **nickel, cobalt, copper and manganese** from the ocean floor, especially from polymetallic nodules. These minerals are important for clean-energy technologies and strategic industries. However, the deep ocean is a **poorly understood and fragile ecosystem**, making technological capability alone an insufficient basis for exploitation.

Need for a Precautionary Approach:
- **Scientific uncertainty:** Large parts of the deep ocean remain unexplored, and many species are still being discovered.
- **Irreversible habitat loss:** Mining machines can remove nodules and destroy habitats that take thousands or even millions of years to form.

- **Sediment plumes:** Disturbed sediments may spread beyond mining sites and affect marine organisms and food chains.
- **Biodiversity risk:** Species could be damaged or lost before their ecological significance is understood.
- **Weak recovery capacity:** Deep-sea ecosystems generally recover very slowly from physical disturbance.

Need for a Sustainable Approach:

- **Establish genuine necessity:** Mining should be permitted only when mineral demand cannot reasonably be met through safer alternatives.
- **Promote circular economy:** Recycling batteries, electronics and critical minerals can reduce dependence on virgin extraction.
- **Improve resource efficiency:** Efficient technologies and material substitution can lower mineral demand.
- **Environmental safeguards:** Detailed baseline studies, impact assessments and continuous monitoring must precede commercial mining.
- **Protected zones:** Ecologically sensitive areas should be kept permanently outside mining activity.
- **Strong governance:** International rules under the **International Seabed Authority** should ensure transparency, liability and ecosystem protection.

Conclusion:

Deep-sea minerals may strengthen economic and strategic security, but the ocean floor is also valuable **natural capital**. Therefore, India and the world should follow the principle: **Explore scientifically → assess necessity → protect sensitive ecosystems → mine only when justified and environmentally acceptable.** True progress lies not merely in knowing **how to mine**, but also in knowing **when not to mine**.

14. Environmental challenges such as climate change, biodiversity loss, freshwater stress and pollution cannot be addressed in isolation. Discuss in the context of the planetary boundaries framework.

(15 Marks, 250 words)

Introduction:

The **planetary boundaries framework** identifies nine critical Earth-system processes that define a relatively safe operating space for humanity. With **seven of the nine boundaries already transgressed**, it shows that environmental crises are deeply interconnected rather than separate problems.

1. Interlinkages among Environmental Challenges:
    - **Climate change and biodiversity loss:** Rising temperatures alter habitats, increase species extinction and weaken ecosystem resilience.
    - **Deforestation and climate:** Forest loss reduces carbon sequestration, while warming increases forest fires and degradation.
    - **Freshwater stress and ecosystems:** Excessive groundwater extraction and river modification damage wetlands, forests and aquatic biodiversity.
    - **Pollution and biodiversity:** Plastics, pesticides and industrial chemicals contaminate soil and water and disrupt food chains.
    - **Agriculture and nutrient cycles:** Excess nitrogen and phosphorus fertilisers cause eutrophication while also degrading soil and freshwater systems.
    - **Ocean acidification and climate:** Atmospheric carbon dioxide is absorbed by oceans, increasing acidity and damaging coral reefs and marine organisms.

2. **Why Isolated Solutions Are Inadequate?**
   - Solving one problem without considering others may simply **shift environmental pressure** elsewhere.
   - Large-scale biofuel cultivation, for instance, may reduce fossil-fuel use but increase **land and freshwater pressure**.
   - Similarly, poorly planned hydropower may support low-carbon energy while disturbing **river ecosystems and biodiversity**.
3. **Need for an Integrated Approach:**
   - A planetary-boundaries approach requires: **Climate mitigation + ecosystem restoration + sustainable agriculture + water conservation + pollution control + circular economy**.
   - It also demands coordination across sectors such as **energy, agriculture, forests, industry and urban development**.

Conclusion:

The planetary boundaries framework demonstrates that the Earth functions as an **interconnected system**. Environmental governance must therefore move from isolated, sector-specific interventions towards **integrated Earth-system management**, ensuring that progress in one area does not destabilise another.

E. Geography

15. Hanging-glacier collapses present transboundary risks to human settlements, hydropower projects and regional energy security. Discuss the need for coordinated disaster-risk management among Himalayan countries. (15 marks, 250 words)

Introduction:

Hanging glaciers are ice masses situated on steep mountain slopes above valleys. Rising temperatures, permafrost thaw and extreme precipitation can destabilise them, triggering ice-rock avalanches, landslides, flash floods and **glacial lake outburst floods (GLOFs)**. Since Himalayan rivers and energy networks cross national boundaries, their impacts cannot be managed by one country alone.

Transboundary Risks:

- **Human settlements:** Flood waves and debris originating upstream can rapidly reach downstream settlements across borders, damaging lives, agriculture, roads and communication systems.
- **Hydropower infrastructure:** Avalanches may block rivers or damage dams, tunnels and powerhouses. The subsequent breach of temporary blockages or reservoirs can cause cascading failures.
- **Regional energy security:** Himalayan countries depend significantly on hydropower. Project disruption can affect national electricity grids, industries and cross-border power trade.
- **Cascading hazards:** A glacier collapse may trigger landslides, river damming, reservoir overflow and secondary floods, expanding the disaster far beyond its point of origin.
- **Information asymmetry:** Downstream countries may receive inadequate warning when glacier movement, extreme rainfall or river blockage occurs upstream.
- **Shared climate vulnerability:** Warming and glacier retreat affect the entire Hindu Kush–Himalayan region, making isolated national assessments inadequate.

Why Coordinated Disaster-Risk Management Is Necessary:

- Hazards must be assessed at the **river-basin level**, rather than within political boundaries.
- Shared monitoring reduces duplication, fills scientific data gaps and improves forecasting accuracy.
- Common warning protocols provide downstream authorities more time for evacuation and reservoir regulation.
- Coordinated dam operations can prevent sudden releases and cascading hydropower failures.
- Joint preparedness strengthens rescue, relief and reconstruction in remote border regions.

Required Framework:

- Develop a common inventory of hanging glaciers, glacial lakes and exposed infrastructure.
- Establish regional monitoring using satellites, drones, seismic sensors and automatic weather stations.
- Share real-time data on glacier movement, rainfall, river discharge and reservoir levels.
- Adopt common hydropower safety standards, cumulative-impact assessments and emergency action plans.
- Conduct joint flood modelling, evacuation drills and community-based preparedness.
- Strengthen **ICIMOD, WMO, SAARC mechanisms** and bilateral river institutions.
- Create regional emergency-financing and humanitarian-assistance protocols.

Conclusion:

Hanging-glacier collapses represent a **shared and cascading Himalayan risk**. A basin-wide framework based on scientific cooperation, real-time information, resilient infrastructure and mutual trust is essential to protect downstream communities and regional energy security.

16. "Sea-level rise is no longer merely an environmental concern; it poses fundamental challenges to statehood, maritime rights and climate justice." Discuss with particular reference to vulnerable Small Island Developing States. (15 Marks, 250 words)

Sea-level rise has evolved from an environmental concern into a challenge to sovereignty, international law and climate justice. The recent UN declaration recognises that the submergence of territory need not automatically end a state's statehood or established maritime rights.

Challenges posed by sea-level rise:

1. Threat to statehood and citizenship:
   - Traditionally, statehood is associated with territory, population and effective government.
   - Low-lying Pacific States such as **Tuvalu** face the possibility that significant parts of their territory may become uninhabitable or submerged.
   - The **Marshall Islands** similarly illustrate how climate change can threaten the physical territorial basis of a State.
   - The UN declaration therefore supports continuity of statehood even after substantial territorial loss.
2. Maritime rights:
   - Retreating coastlines can alter the baselines from which territorial seas and Exclusive Economic Zones (EEZs) are measured.
   - For island States such as **Tuvalu and the Marshall Islands**, loss of maritime space could mean loss of fisheries and seabed resources in addition to land.
   - Hence, stability of already established maritime zones is crucial.
3. Development and displacement:
   - Sea-level rise threatens housing, freshwater, ports, roads and livelihoods.
   - Small Island Developing States have limited land and financial capacity for large-scale relocation and adaptation.
4. Climate justice:
   - Many vulnerable island States have contributed little to historical emissions but face disproportionately severe impacts, strengthening demands for climate finance and technological assistance.

Way Forward:

- Legally ensure **continuity of statehood and citizenship**.
- Preserve existing **maritime boundaries and EEZs** despite coastline changes.
- Expand **adaptation and loss-and-damage finance** for SIDS.
- Build resilient infrastructure and early-warning systems.
- Restore **mangroves and seagrass ecosystems** as natural coastal barriers.
- Accelerate global emission reductions, as adaptation alone cannot prevent continued sea-level rise.

Conclusion:

The experiences of **Tuvalu and the Marshall Islands** demonstrate that sea-level rise can threaten not merely territory but the legal and economic foundations of sovereign States. International climate action must therefore combine **mitigation, adaptation, legal protection and climate justice**.

F. Science and Technology

17. Why is India moving towards a uniform and traceable Indian Standard Time (IST) framework? Discuss its significance for digital infrastructure and national security. (10 Marks, 150 Words)

Introduction:

India has notified the **Legal Metrology (Indian Standard Time) Rules, 2026** to ensure that critical government and commercial systems use a **uniform, authorised and traceable IST reference**. The aim is not to change India's time zone, but to ensure precise synchronisation across digital and strategic systems.

Why a uniform IST framework is needed?

- Different organisations may currently obtain time from different sources, creating small but important variations.
- Precise timestamps are essential in **banking, stock markets, telecom networks and power grids**.
- Uniform time improves reliability of **digital records, audits and transaction sequencing**.
- It strengthens **cyber-forensics**, as investigators can accurately reconstruct the sequence of cyber incidents.

Strategic significance:

- **CSIR-NPL** maintains India's official scientific time through highly accurate atomic clocks.
- Greater domestic control reduces dependence on foreign-controlled timing systems such as **GPS**.
- Indigenous timing infrastructure improves resilience during **cyberattacks, satellite disruption or geopolitical tensions**.
- It supports **NavIC, digital sovereignty and critical infrastructure security**.

Conclusion:

A uniform IST framework transforms timekeeping into a component of **digital governance and national security**. It can enhance financial integrity, cybersecurity, infrastructure coordination and India's technological self-reliance.

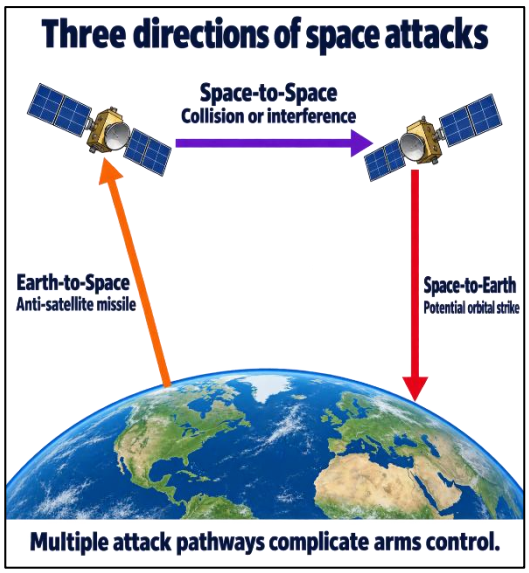
18. Existing international agreements are inadequate to prevent the weaponisation of outer space. Critically examine. (15 marks, 250 words)

Outer space supports communication, navigation and national security. Growing anti-satellite capabilities expose weaknesses in international agreements, although these frameworks remain essential safeguards against unrestricted weaponisation.

Existing safeguards:

- **Outer Space Treaty, 1967:** Prohibits nuclear weapons and other weapons of mass destruction in orbit; reserves celestial bodies for peaceful purposes, banning military bases, weapons testing and manoeuvres there.
- **UN Charter:** Its restrictions on the threat or use of force also apply to space activities.
- **Supporting conventions:** The Liability Convention and Registration Convention provide mechanisms for responsibility, compensation and identifying space objects.

Why these agreements are inadequate?



- **Limited coverage:** The Outer Space Treaty does not comprehensively prohibit conventional weapons in orbit or ground-launched anti-satellite systems.
- **Technological gaps:** Cyberattacks, signal jamming and interference challenge rules developed before these capabilities became prominent.
- **Verification difficulties:** Dual-use spacecraft can repair satellites or damage them, making hostile intentions difficult to establish.
- **Weak enforcement:** Attribution problems, strategic secrecy and geopolitical rivalries obstruct accountability and agreement on stronger restrictions.
- **Shared environmental risks:** Destructive attacks generate debris, potentially triggering cascading collisions - **Kessler syndrome** - and endangering uninvolved countries' satellites.

A balanced assessment and way forward:

- Existing treaties establish restraints and legal principles; their inadequacy reflects incomplete coverage and implementation rather than complete irrelevance.
- States should negotiate verifiable restrictions on destructive anti-satellite activities, establish notification and crisis-communication mechanisms, and strengthen debris-mitigation commitments.
- India, having demonstrated anti-satellite capability through **Mission Shakti**, should combine satellite resilience with responsible behaviour and multilateral diplomacy.

Thus, preventing weaponisation requires updating existing frameworks while preserving their foundational principles of peaceful cooperation and international responsibility.

19. Why is a strong domestic semiconductor industry important for India? Discuss its economic and strategic significance. (10 Marks, 150 Words)

Introduction:

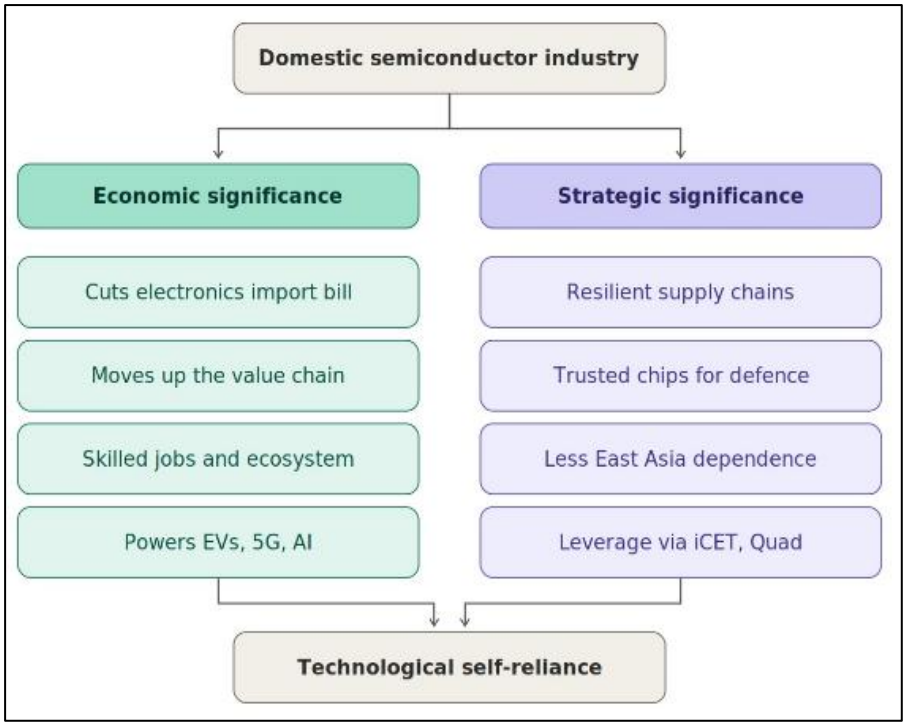
Semiconductors power the digital economy, from smartphones to defence systems. A strong domestic industry is essential for India's development and technological autonomy.

Importance for India:

- Meets growing chip demand across industries.
- Reduces import dependence and exposure to global disruptions.
- Builds capabilities essential for economic and national security.

Economic significance:

- **Value addition:** Moves India beyond electronics assembly towards higher-value manufacturing.
- **Employment:** Creates skilled jobs in design, fabrication and packaging.
- **Industrial ecosystem:** Attracts investment and develops domestic supplier networks.
- **Innovation:** Supports artificial intelligence, electric vehicles, telecommunications and renewable energy.



Strategic significance:

- **Supply resilience:** Cushions disruptions arising from geographically concentrated global production.
- **National security:** Trusted chips strengthen defence systems, satellites and critical infrastructure.
- **Technological autonomy:** Reduces vulnerability to foreign export restrictions.
- **Global influence:** Strengthens India's position in international technology partnerships.

Conclusion:

Sustained investment, research and skilled talent can build a globally competitive semiconductor ecosystem, strengthening India's economic prosperity and strategic autonomy.

20. "Artificial Intelligence need not become conscious to create serious ethical problems." Examine the ethical concerns arising from increasingly autonomous AI systems with reference to human dignity, accountability, fairness and moral responsibility. Suggest principles for ensuring human-centred AI governance.

(15 Marks, 250 words)

Artificial Intelligence (AI) refers to computer systems capable of performing tasks such as learning, reasoning, prediction and decision-making that ordinarily require human intelligence.

AI need not possess consciousness or emotions to produce serious ethical consequences. Its growing role in recruitment, healthcare, policing, finance and public administration makes **human control and value alignment** crucial.

Ethical Concerns:

- **Human dignity:** Treating individuals merely as data profiles can ignore context and compassion; for example, automated welfare screening may wrongly exclude deserving beneficiaries.
- **Loss of autonomy:** Recommendation algorithms and targeted advertising can influence behaviour and choices without users fully understanding such manipulation.
- **Fairness and bias:** Historical prejudices embedded in data can be reproduced by AI. Example: Amazon discontinued an experimental recruitment tool after it was found to disadvantage women candidates.

- **Accountability gap:** When autonomous systems cause harm, responsibility may become diffused among developers, companies and users, as seen in disputes involving **self-driving vehicles**.
- **Opacity:** Black-box algorithms may deny people understandable reasons for decisions affecting loans, jobs or insurance.
- **Privacy:** Facial recognition and large-scale profiling can enable intrusive surveillance and undermine informational autonomy.
- **Moral responsibility:** Decisions involving life and death, such as **lethal autonomous weapons**, cannot ethically be reduced entirely to machine optimisation.
- **Inequality:** Unequal access to AI capabilities may widen technological, economic and educational divides.

Principles for Human-Centred AI Governance:

- **Human oversight:** Retain human authority in high-risk decisions, particularly healthcare, policing and weapons.
- **Fairness and auditability:** Conduct regular bias and impact assessments.
- **Transparency:** Provide explanations and mechanisms to challenge automated decisions.
- **Accountability by design:** Clearly assign responsibility throughout the AI lifecycle.
- **Privacy and proportionality:** Collect only necessary data and impose stronger safeguards for higher-risk systems.
- **Inclusiveness:** Involve vulnerable communities in technology design and regulation.

Such principles are reflected in initiatives like **India's Responsible AI approach**, **UNESCO's AI Ethics framework**, and the **EU AI Act's risk-based regulation**.

Conclusion:

The deeper ethical challenge is not whether machines become conscious, but whether humans remain morally responsible for the systems they create. AI must augment human capabilities without displacing dignity, justice, accountability and human agency.

21. "Subsea fibre-optic cables have become critical infrastructure for the digital economy." Explain their significance and discuss the major technological and security challenges associated with them.

(10 Marks, 150 Words)

Introduction:

Subsea fibre-optic cables carry over 99% of international data traffic, connecting continents through light signals. They underpin digital transactions, communication and services, making their resilience essential for economic stability.

Significance:

- **Economic backbone:** Facilitate banking, international payments, e-commerce and coordination of global supply chains.
- **Digital transformation:** Offer high bandwidth and low latency for cloud computing, artificial intelligence and research.
- **India's interests:** Support IT exports, digital businesses and connectivity with global markets.

Technological challenges:

- **Engineering complexity:** Deep-sea pressure, corrosion and signal attenuation require protective layers, repeaters and reliable power.

- **Difficult repairs:** Locating faults and deploying specialised vessels is expensive; weather and permissions delay restoration.
- **Physical damage:** Fishing nets, anchors, earthquakes and submarine landslides threaten cable integrity.

Security challenges:

- **Deliberate interference:** Sabotage, espionage and cyberattacks on landing stations can disrupt communications.
- **Strategic chokepoints:** Concentration of routes and landing stations increases vulnerability to simultaneous failures.
- **Governance gaps:** Cross-border ownership and overlapping jurisdictions complicate surveillance, accountability and coordinated protection.

Conclusion:

India must diversify cable routes, secure landing stations and strengthen domestic repair capacity. International cooperation and clear protection protocols can safeguard these digital lifelines while ensuring reliable and affordable connectivity.

G. Indian Society & Social Justice

22. "Menopause and perimenopause are not merely biological transitions but also important public-health and social issues." Discuss.

Introduction:

Perimenopause is the transition phase before menopause, while **menopause** marks the permanent end of menstruation. Though natural biological processes, their physical, mental and social consequences make them important **public-health and women's issues**.

Public-Health Dimension:

- Symptoms such as **hot flashes, sleep disorders, fatigue, joint pain and anxiety** may require medical attention.
- Lack of screening and counselling can reduce women's **quality of life and productivity**.
- Health systems often focus more on pregnancy and reproductive-age women, leaving a **midlife-care gap**.
- Community-level services can enable early diagnosis, counselling and referral.

Social Dimension:

- Menopause is often surrounded by **silence, stigma and poor awareness**.
- Symptoms may affect women's **work, family responsibilities and emotional well-being**.
- Women may hesitate to seek treatment because their concerns are dismissed as "normal ageing".
- Family and workplace sensitivity can improve support.

Conclusion:

Thus, menopause should be addressed through a **life-cycle approach to women's health**, combining medical care, awareness, counselling and social support.

23. "Malnutrition is not merely a food-deficiency problem but a multidimensional challenge involving healthcare, sanitation, caregiving and social behaviour." Discuss with reference to Mission Poshan 2.0.

(10 Marks, 150 Words)

Introduction:

Malnutrition includes undernutrition, micronutrient deficiencies, overweight and obesity. It is not caused merely by insufficient food, but by the interaction of health, sanitation, caregiving practices, gender relations and household poverty.

Multiple dimensions of malnutrition:

- **Healthcare:** Maternal anaemia, repeated infections, inadequate antenatal care and incomplete immunisation impair nutrient absorption and child growth.
- **Water and sanitation:** Contaminated water, poor hygiene and open defecation increase diarrhoea and environmental enteric dysfunction.
- **Caregiving:** Inadequate breastfeeding, improper complementary feeding and lack of early stimulation weaken physical and cognitive development.
- **Social factors:** Early marriage, food taboos, gender discrimination and women's limited decision-making perpetuate intergenerational malnutrition.
- **Emerging challenge:** Cheap, energy-dense processed foods contribute to obesity, creating a **double burden of malnutrition**.

Mission Poshan 2.0 response:

- It integrates **POSHAN Abhiyaan, Anganwadi Services and the Scheme for Adolescent Girls.**
- Anganwadi Centres provide supplementary nutrition, growth monitoring, counselling and early childhood care.
- The **Poshan Tracker** supports real-time monitoring, while **Jan Andolan** promotes behavioural change and community participation.
- Its convergence approach links nutrition with health, sanitation and social protection.

Conclusion:

Mission Poshan 2.0 must strengthen Anganwadi capacity, dietary diversity, local accountability and convergence with health, sanitation and women-empowerment programmes to break the intergenerational cycle of malnutrition.

H. Internal Security

24. Drug trafficking in Punjab is both an internal security challenge and a public health crisis. Discuss.

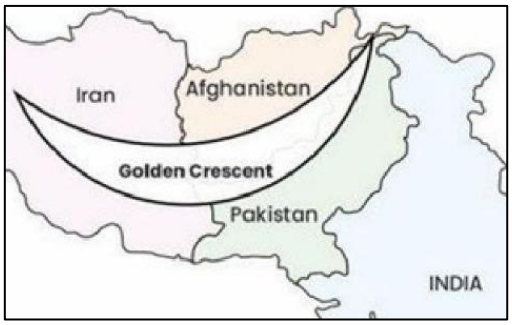
(10 Marks, 150 Words)

Introduction:

Punjab's proximity to the Pakistan border and established trafficking routes make narcotics a multidimensional threat. Drug trafficking affects individual health, border security, organised crime and social stability.

Drug trafficking as an Internal Security Challenge:

- **Cross-border trafficking:** Heroin and synthetic drugs enter through border routes, increasingly using drones.
- **Narco-terror nexus:** Drug proceeds can finance terrorist networks, while traffickers use organised criminal chains.
- **Governance impact:** Money laundering, corruption and local distribution networks weaken law enforcement.



Drug trafficking as a Public Health Crisis:

- Addiction damages physical and mental health, particularly among youth.
- Families face indebtedness, crime, social breakdown and loss of productive human capital.
- Overdose, unsafe injecting practices and inadequate rehabilitation burden health services.

Way Forward:

- Improve BSF-police-NCB coordination, anti-drone surveillance, border intelligence and financial investigations.
- Expand prevention, counselling, de-addiction, rehabilitation and livelihood support.

Conclusion

Punjab needs a combined security and public-health strategy that disrupts drug supply networks while reducing demand through treatment, rehabilitation and community participation.

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