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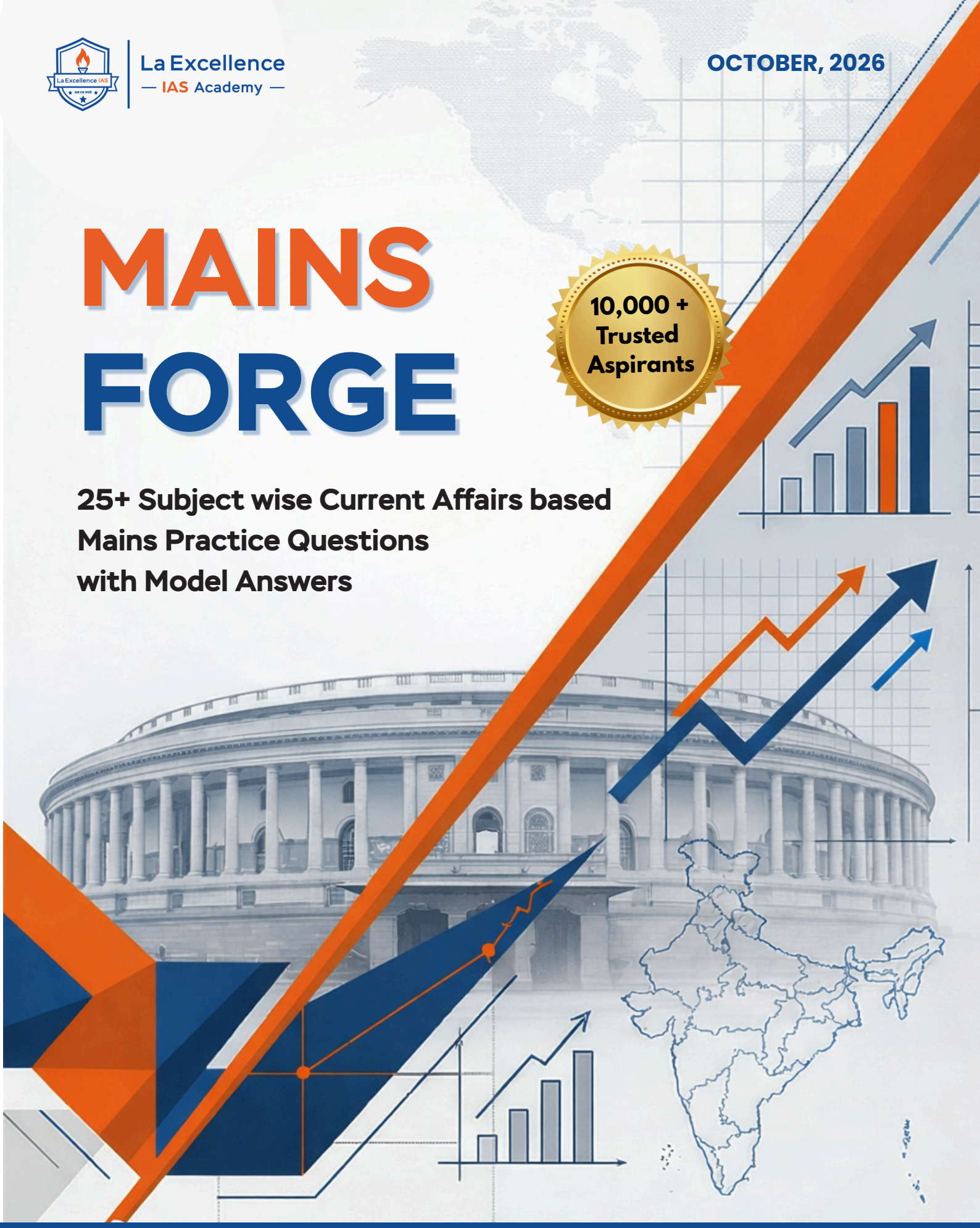

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A. Polity & Governance

1. Examine the concerns regarding the independence of the Election Commission of India in the appointment of the Chief Election Commissioner and other Election Commissioners.

(10 Marks, 150 Words)

Introduction:

The **Election Commission of India (ECI)** derives its authority from **Article 324**. Since it supervises elections in which the incumbent government itself is a contestant, the appointment of the **CEC and Election Commissioners (ECs)** must ensure both actual and perceived independence.

Concerns in the Appointment Mechanism:

- **Executive majority:** The 2023 Act's Selection Committee comprises the **Prime Minister, Leader of Opposition and a Union Cabinet Minister nominated by the PM**, giving the executive an effective 2:1 majority.
- **Exclusion of CJI:** The Act replaced the **Chief Justice of India**, included under the *Anoop Baranwal* interim arrangement, with a Cabinet Minister.
- **Executive-dominated shortlisting:** The Search Committee is headed by the **Law Minister**, increasing governmental influence over the candidate pool.
- **Transparency concerns:** Limited disclosure of shortlisting criteria and deliberations may weaken objective scrutiny.

Implications for ECI Independence:

- Creates a **perception of institutional dependence** on the government.
- May weaken public confidence in the ECI's **neutrality and impartiality**.
- Raises concerns where the Commission must adjudicate matters involving the **ruling party**.
- Could affect confidence in the constitutional guarantee of **free and fair elections**.

Conclusion:

Though the statutory process and Opposition participation are safeguards, a more balanced and transparent appointment mechanism would strengthen ECI independence.

2. Despite its transformative potential, the Right to Information Act continues to suffer from significant institutional and administrative shortcomings. Critically examine the major challenges in its implementation and suggest measures to strengthen its effectiveness.

(15 Marks, 250 Words)

Introduction:

The RTI Act, 2005, rooted in Article 19(1)(a), transformed Indian governance by empowering citizens to demand transparency and accountability. However, its effectiveness remains constrained by institutional, administrative and legislative challenges.

Achievements of RTI:

- Democratic Empowerment: Strengthened citizen participation, transparency and accountability.
- Exposing Corruption: RTI disclosures contributed to exposing the Adarsh Housing Society irregularities.
- Welfare Accountability: Enabled public scrutiny of PDS, MGNREGA and government expenditure.

Critical Examination of Challenges:

- Poor Proactive Disclosure: Weak Section 4 compliance; only 62.7% of public authorities submitted transparency audit reports in 2024–25.
- Institutional Weaknesses: Commission vacancies, inadequate staffing and mounting pendency undermine timely justice.
- Weak Enforcement: Infrequent penalties and bureaucratic secrecy encourage unjustified information denials.
- Legislative Concerns: The 2019 amendment raised concerns about commissioners' independence; the DPDP Act, 2023, amended RTI's personal-information exemption, raising transparency concerns.
- Competing Interests: While transparency is essential, legitimate privacy, confidentiality and national-security concerns require protection.
- Accessibility: Digital exclusion, poor record management and threats against activists disproportionately affect vulnerable citizens.

Way Forward:

- Institutional Reforms: Ensure timely appointments, adequate staffing and commission independence.
- Proactive Disclosure: Strengthen Section 4 compliance through independent audits.
- Accountability: Enforce penalties and strengthen whistleblower protection.
- Balanced Disclosure: Apply public-interest tests and proportionate privacy safeguards.
- Administrative Reforms: Digitise records and improve citizen awareness.

Conclusion:

RTI's transformative potential is undeniable, but legal rights require effective institutional enforcement. Balancing transparency with legitimate confidentiality can strengthen accountable governance.

3. "The independence of the Election Commission of India and its accountability are mutually reinforcing constitutional requirements." Discuss.

(10 Marks, 150 Words)

Introduction:

The Election Commission of India (ECI), empowered by **Article 324**, safeguards free and fair elections. Independence enables impartial decisions, while accountability ensures that its authority serves constitutional democracy.

Independence: essential for impartiality:

- **Functional autonomy** protects electoral scheduling, supervision and enforcement from partisan interference, ensuring a level playing field.
- **Security of tenure:** The Chief Election Commissioner enjoys removal safeguards equivalent to a Supreme Court judge; other Commissioners require the CEC's recommendation for removal.
- Independent decision-making allows the Commission to act against electoral misconduct, including violations by ruling parties.

Accountability: essential for legitimacy:

- **Reasoned orders, transparent procedures and timely disclosure** help citizens assess whether electoral rules are applied consistently.
- **Judicial review**, subject to constitutional restrictions on intervention during elections, checks arbitrariness and protects electoral rights.
- Effective grievance redressal and explanations for disputed decisions strengthen public confidence without creating executive control.

Conclusion:

Independence and accountability reinforce each other - autonomy enables fairness, while scrutiny builds trust. Transparent appointments, institutional autonomy and reasoned decisions can strengthen both, preserving the ECI's credibility as an impartial constitutional institution.

B. International Relations

4. How can a more stable U.S.-China relationship affect India's strategic and economic interests? Explain.

(10 Marks, 150 Words)

Introduction:

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.

5. "Regime-change wars by major powers often achieve military objectives but fail to produce durable political stability." Critically examine with suitable examples. Also discuss the implications of such interventions for India's strategic interests.

(15 Marks, 250 Words)

Introduction:

Regime-change wars seek to remove an existing government through external military intervention. While superior military power can quickly overthrow regimes, creating legitimate institutions, social reconciliation and durable political order is far more difficult.

Why Military Success Often Fails to Produce Stability:

- **Iraq, 2003:** The U.S.-led coalition rapidly removed Saddam Hussein, but dismantling state institutions created a power vacuum, sectarian conflict and conditions for the rise of **Al-Qaeda in Iraq and ISIS**.
- **Afghanistan, 2001:** The Taliban regime was initially displaced, but weak institutions, corruption and continued insurgency enabled the Taliban to return to power in **2021**.
- **Libya, 2011:** NATO intervention contributed to Muammar Gaddafi's fall, but Libya subsequently fragmented among rival governments, militias and external actors.
- Regime change can also disturb **regional balances of power**. Saddam's removal, for instance, significantly expanded Iran's influence in Iraq.
- External powers may win conventional wars but often lack the **local legitimacy, knowledge and sustained political commitment** required for nation-building.

However, Intervention Is Not Always Ineffective:

- Military intervention can remove oppressive regimes, disrupt immediate security threats and create opportunities for political transition.
- Outcomes depend on **post-war institution-building, local participation, reconciliation and sustained international support**, not military victory alone.

Implications for India:

- **Energy security:** Instability in West Asia can disrupt oil supplies and raise prices.
- **Diaspora:** Conflict threatens millions of Indians working in the Gulf and can necessitate evacuations.
- **Security:** State collapse can provide space for terrorism and radicalisation affecting India.
- **Connectivity and trade:** Wars can disrupt sea lanes, investments and projects linking India with West and Central Asia.
- **Foreign policy:** Such interventions strengthen India's preference for **strategic autonomy, sovereignty and negotiated political solutions**.

Conclusion:

Regime change demonstrates that **removing a government is easier than rebuilding a state**. For India, preventing prolonged instability through diplomacy, multilateralism and respect for sovereignty remains strategically preferable.

6. "The crisis of multilateralism is primarily a crisis of political will rather than institutional capacity." Examine this statement in the context of the United Nations.

(10 Marks, 150 Words)

Introduction:

Multilateralism depends on nations cooperating through shared rules and institutions. Despite its universal membership and extensive mandate, the United Nations (UN) struggles to address major conflicts. This reflects declining political commitment as well as structural shortcomings.

Political Will: The Principal Constraint:

- **Great-power rivalry:** Vetoes over Ukraine (2022) and Gaza (2025) demonstrate how strategic interests obstruct collective security.
- **Unilateralism:** Withdrawal from UN-linked institutions and the preference for parallel forums weaken collective decision-making.
- **Implementation deficit:** The General Assembly's demand for Russian withdrawal from Ukraine lacked enforceability; unpaid contributions constrain peacekeeping.

Institutional Limitations Cannot Be Ignored:

- **Veto and representation:** The Security Council's structure permits paralysis; Africa lacks a permanent seat.
- **Dependence on states:** The UN has no standing army and relies on members for funds and enforcement.

Way Forward:

- Expand Security Council representation, encourage responsible veto use, ensure timely funding and strengthen preventive diplomacy. India's G4 initiative supports representative reform.

Conclusion:

The UN's crisis cannot be resolved by administrative reforms alone. Effective multilateralism requires renewed political will supported by legitimate, adequately resourced institutions. Political cooperation and institutional reform must therefore reinforce each other.

C. Economy

7. What are the major challenges in promoting regenerative agriculture among small farmers?

(10 Marks, 150 Words)

Introduction:

Regenerative agriculture focuses on restoring soil health, biodiversity and ecosystem functions while maintaining farm productivity. However, its adoption among India's small and marginal farmers remains limited.

Major Challenges:

- **High transition risk:** Benefits such as improved soil fertility accrue gradually, while farmers face immediate risks of lower yields during the transition period.
- **Limited financial capacity:** Small farmers often lack resources to invest in composting, mulching, cover crops, bio-inputs and diversified farming.
- **Knowledge gaps:** Limited access to extension services and technical knowledge makes adoption of regenerative practices difficult.
- **Input and market constraints:** Availability of quality bio-inputs, seeds and farm machinery is uneven; premium markets for sustainably produced crops are also underdeveloped.
- **Small and fragmented holdings:** Fragmentation makes crop diversification, livestock integration and efficient resource management difficult.
- **Weak institutional support:** Existing agricultural policies and procurement systems remain largely oriented towards conventional input-intensive production.

Way Forward:

- Strengthen extension services through FPOs, Krishi Vigyan Kendras and farmer field schools.
- Provide transition incentives, credit and risk insurance to small farmers.
- Promote local bio-input centres, custom-hiring facilities and community composting.
- Develop value chains and certification/traceability systems for regenerative produce.
- Encourage region-specific regenerative models integrating indigenous practices with modern science.

Conclusion:

A farmer-centric approach combining technology, finance, markets and institutional support can make regenerative agriculture economically viable and environmentally sustainable for small farmers.

8. "The Essential Commodities Act seeks to balance consumer protection with the efficient functioning of agricultural markets." Explain the major provisions of the Act and critically examine its relevance in contemporary India.

(15 Marks, 250 Words)

Introduction:

The **Essential Commodities Act, 1955** empowers the government to ensure adequate supplies of essential goods at fair prices. Its implementation must reconcile consumer protection with farmers' incentives and agricultural market efficiency.

Major provisions:

- **Coverage:** Covers foodstuffs, fertilisers, drugs and petroleum products; the Centre can modify the list.
- **Regulation:** Section 3 authorises control over production, supply, distribution and trade through government orders.
- **Control measures:** Enables stock limits, price controls, licensing, movement restrictions and compulsory sale of stocks.
- **Enforcement:** Powers may be delegated to States; contraventions attract seizure, confiscation, imprisonment and fines.
- **Legal position:** The 2020 liberalising amendment was repealed in 2021, removing its restrictions on agricultural interventions.

Contemporary relevance:

- **Protecting consumers:** Checking hoarding and artificial scarcity can contain food inflation, particularly benefiting poorer households.
- **Managing emergencies:** Enables intervention during droughts, crop failures and supply disruptions.
- **Ensuring availability:** Regulation supports equitable access to food and essential agricultural inputs.

Limitations:

- **Investment uncertainty:** Unpredictable stock limits discourage investment in warehousing, cold chains and food processing.
- **Farmer losses:** Restrictions on procurement and storage may reduce traders' demand during harvest, depressing farmgate prices.
- **Enforcement concerns:** Administrative discretion creates compliance burdens and opportunities for harassment.
- **Structural shortcomings:** Controls cannot independently overcome inadequate infrastructure, low productivity and fragmented markets.

Way forward:

- Adopt transparent, evidence-based triggers and time-bound interventions.
- Distinguish legitimate commercial storage from deliberate hoarding.
- Strengthen stock disclosures, market intelligence and coordinated enforcement.
- Expand buffer stocks, storage infrastructure and farmer-producer organisations.

Conclusion:

The Act remains an important safeguard against scarcity and exploitation. Predictable, proportionate implementation can protect consumers while supporting remunerative farming and efficient markets.

9. "The central challenge before India's MSME sector is no longer merely survival, but successful scaling." Discuss in the context of the SME Growth Fund and India's 'missing middle' problem.

(15 Marks, 250 Words)

Introduction:

India's MSME sector is a major source of **employment, manufacturing output and exports**. However, the policy challenge is increasingly shifting from merely helping firms survive towards enabling promising enterprises to **grow into larger, more productive and globally competitive companies**.

India's "Missing Middle" Problem:

- India has a very large number of micro and small enterprises, but comparatively fewer firms successfully transition into **medium and large enterprises**.
- Many firms remain small because of limited access to **long-term growth capital, advanced technology, professional management and global markets**.
- Bank finance is predominantly debt-based, requiring regular repayment and collateral, which can constrain firms undertaking risky or long-gestation expansion.
- This produces a **"missing middle"**—a weak layer of medium-sized firms between numerous small enterprises and a limited number of large corporations.

Role of the SME Growth Fund:

The proposed **₹10,000-crore SME Growth Fund** seeks to address this gap through **patient equity capital**.

- Equity finance reduces immediate repayment pressures and allows firms to invest in capacity expansion.
- It can finance **new factories, automation, R&D, technology acquisition and acquisitions**.
- Greater scale can improve productivity and reduce unit costs.
- Stronger SMEs can enter **global value chains**, expand exports and generate formal employment.
- Support to firms in Tier-II and Tier-III clusters can also promote more geographically balanced industrialisation.

Concerns:

- Selection of beneficiary firms must remain transparent and commercially sound.
- Professional fund management is essential to avoid politically influenced "picking of winners".
- Finance alone must be complemented by better infrastructure, skills, technology and market access.

Conclusion:

The SME Growth Fund represents a shift from **protecting small firms to enabling them to scale**. If backed by transparent governance and wider ecosystem reforms, it can help India convert its large MSME base into a stronger layer of productive, innovative and globally competitive enterprises.

10. "The growing use of edible oils for biodiesel has intensified the food-versus-fuel dilemma." Discuss its implications for food inflation, food security and energy transition, with particular reference to India.

(15 Marks, 250 Words)

Introduction:

The **food-versus-fuel dilemma** arises when food crops are diverted for energy production. Vegetable oils such as **palm, soybean and rapeseed oil** can be converted into **Fatty Acid Methyl Esters (FAME)** for blending with diesel. Rising biodiesel mandates in major producers, particularly **Indonesia and Malaysia**, have intensified competition between food and fuel uses.

Implications:

Food inflation:

- Biofuel mandates divert edible oils away from food markets, tightening global supplies and raising prices.
- Indonesia's move towards **B50 biodiesel** is expected to substantially increase domestic palm-oil consumption, reducing exportable surplus.
- India, a major importer of palm oil, therefore becomes vulnerable to imported inflation.
- Weather shocks such as **El Niño** and geopolitical disruptions can amplify such price pressures.

Food security:

- Higher edible-oil prices disproportionately affect poorer households by increasing the cost of everyday cooking.
- Reduced global availability can expose import-dependent countries to supply disruptions.
- Diversion of agricultural land towards energy crops may create competition with food production.
- Price volatility also complicates food-processing and nutrition-related expenditure.

Energy transition:

- Biodiesel can **reduce dependence on petroleum diesel** and support lower-carbon transport.
- It creates additional demand for agricultural commodities and can diversify energy sources.
- However, excessive reliance on food-based biofuels may merely **shift energy insecurity into food insecurity**.
- Expansion of oil-palm cultivation may also generate land-use and ecological concerns.

Way Forward:

- Prioritise **waste oils, non-edible feedstocks and second-generation biofuels**.
- Expand domestic oilseed productivity under initiatives such as the **National Mission on Edible Oils**.
- Keep blending mandates **flexible during food-price or supply shocks**.
- Diversify edible-oil imports while maintaining strategic buffers.

Conclusion:

India's energy transition should pursue biofuels without compromising food affordability, nutritional security and ecological sustainability.

D. Environment, Ecology & Disaster Management

11. Recent drought declarations in Karnataka, Andhra Pradesh and Maharashtra highlight India's continuing vulnerability to monsoon variability. Examine the climatic and human-induced factors responsible for recurring droughts in India.

(10 Marks, 150 Words)

Introduction:

India's agriculture and water resources remain highly dependent on the **south-west monsoon**. Therefore, even moderate rainfall deficits, when combined with poor water management, can generate recurrent drought conditions.

Climatic Factors:

- **Monsoon variability:** Delayed onset, early withdrawal or long dry spells can sharply reduce seasonal rainfall.
- **El Niño:** Warming of the equatorial Pacific often weakens the Indian monsoon and increases drought risk.
- **Uneven spatial distribution:** Some regions receive deficient rainfall even when all-India rainfall is near normal.
- **Climate change:** Rising temperatures increase **evapotranspiration**, intensify soil-moisture loss and make rainfall more erratic.
- **Rain-shadow geography:** Interior parts of **Karnataka, Maharashtra and Andhra Pradesh** are naturally drought-prone.

Human-Induced Factors:

- **Groundwater over-extraction** lowers aquifers and reduces drought resilience.
- Cultivation of **water-intensive crops** such as sugarcane in dry regions aggravates water stress.
- Loss of tanks, wetlands and local water bodies reduces natural storage capacity.
- **Deforestation and land degradation** weaken soil moisture retention and recharge.
- Poor irrigation efficiency and weak watershed management worsen meteorological drought into **agricultural and hydrological drought**.

Conclusion:

Recurring droughts in India result from the interaction of **climatic variability with unsustainable water and land use**. Long-term resilience requires watershed restoration, crop diversification, efficient irrigation and scientific drought preparedness.

12. Groundwater contamination by arsenic, fluoride, nitrates and emerging pollutants such as PFAS poses a serious public health challenge in India. Examine the major sources and consequences of such contamination and suggest appropriate remedial measures.

(15 Marks, 250 Words)

Introduction:

Groundwater is a drinking-water source in India, but both aquifer geology and human activities threaten its safety. Contamination often remains undetected without laboratory testing. CGWB's 2025 groundwater-quality report documents contaminated pockets across multiple states.

Major sources:

- **Arsenic:** Naturally mobilised from sediments under oxygen-poor conditions, particularly in parts of West Bengal and Bihar.

- **Fluoride:** Dissolves from fluoride-bearing rocks, especially where groundwater remains underground for long periods.
- **Nitrates:** Leach from chemical fertilisers, livestock waste, sewage and poorly maintained septic tanks.
- **PFAS:** Persistent 'forever chemicals' reach aquifers through industrial discharge, landfill leachate and firefighting foams.

Consequences:

- Arsenic exposure causes skin lesions and increases cancer risk; excessive fluoride produces dental and skeletal fluorosis.
- Nitrates can cause infant methemoglobinemia ('blue baby syndrome'). Some PFAS are associated with weakened immune responses, developmental effects and elevated risks of certain cancers.
- Illness, treatment expenses and unreliable water supplies deepen low-income vulnerability.
- Ordinary boiling does not remove these dissolved chemical contaminants.

Remedial measures:

- **Scientific monitoring:** Strengthen CGWB–state aquifer mapping, periodic testing, public water-quality dashboards and targeted PFAS surveillance.
- **Safe alternatives:** Under Jal Jeevan Mission, provide tested tap-water supplies or uncontaminated sources; maintain contaminant-specific treatment, including adsorption and suitable membrane technologies.
- **Pollution prevention:** Promote judicious fertiliser use, safe sewage disposal, industrial effluent treatment and strict enforcement of the polluter-pays principle.
- **Local resilience:** Protect recharge zones, regulate over-extraction, strengthen village water committees and arrange health screening in affected areas.

Conclusion:

India must judge drinking-water security by verified safety at the point of use, not merely the number of tap connections.

E. Geography

13. Explain the mechanism of El Niño with reference to changes in trade winds, oceanic upwelling and Walker circulation. How does it influence rainfall patterns across different regions of the world?

(15 Marks, 250 Words)

Introduction:

El Niño is the warm phase of the El Niño-Southern Oscillation (ENSO), marked by abnormal warming of surface waters in the central and eastern equatorial Pacific. Through ocean-atmosphere interactions, it alters rainfall across distant regions (teleconnections).

Mechanism of El Niño:

- **Weakening of trade winds:** Normally, easterly trade winds push warm surface water towards Indonesia and Australia. During El Niño, these winds weaken, allowing warm water to spread eastwards.
- **Reduced upwelling:** Warm surface waters suppress the rise of cold, nutrient-rich water along the Peru-Ecuador coast, increasing sea-surface temperatures.

- **Shift in Walker circulation:** Normally, moist air rises over the western Pacific and sinks over the eastern Pacific. El Niño shifts convection and ascending air eastwards, relocating rain-bearing clouds.

Influence on Regional Rainfall:

- **Peru and Ecuador:** Warmer eastern Pacific waters favour heavy rainfall and flooding.
- **Indonesia and Australia:** Weakened convection over the western Pacific raises drought and wildfire risks.
- **India:** Altered atmospheric circulation can weaken the southwest monsoon, threatening agriculture and water security.
- **Other regions:** Rainfall belts shift across the tropics, creating contrasting wet and dry anomalies through teleconnections.

Conclusion:

El Niño demonstrates the close coupling of oceans and atmosphere. However, its effects are not uniform or inevitable: the Indian Ocean Dipole, regional circulation and climate change also modify rainfall outcomes.

F. Science and Technology

14. "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.

15. High-performance computing is increasingly becoming critical for evidence-based governance and strategic decision-making. Examine its applications in areas such as climate modelling, disaster management, healthcare, agriculture and scientific research in India.

(15 Marks, 250 Words)

Introduction:

High-Performance Computing (HPC) refers to the use of powerful computing systems that employ multiple processors to perform massive calculations and simulations at very high speeds. By analysing large datasets and modelling complex systems, HPC increasingly supports evidence-based governance, scientific planning and strategic decision-making in India.

Applications of HPC in India:

Climate and Weather Modelling:

- Supercomputers enable high-resolution **weather forecasting and climate simulations**.
- They improve understanding of extreme rainfall, temperature trends and long-term climate risks, supporting better planning for agriculture, infrastructure and disaster preparedness.

Disaster Management:

- HPC-based **flood prediction systems** can forecast affected areas and improve evacuation and preparedness.
- Under NSM, an early-warning system has been used for the **Mahanadi River basin**, while forest-fire models combine satellite data with computational simulations to predict fire spread.

Healthcare:

- HPC supports **genomics, molecular modelling and drug discovery**.
- During COVID-19, computational platforms were used to screen existing drugs and assess possible adverse effects.

Agriculture:

- HPC assists in **crop-yield prediction**, weather-linked farm advisories and analysis of large agricultural datasets, helping improve productivity and risk management.

Urban and Environmental Governance:

- The **Urban Environment Decision Support System** models heavy rainfall and air pollution, enabling cities to anticipate risks and design mitigation measures.

Scientific and Strategic Research:

- HPC strengthens **astrophysics, materials science, computational chemistry, engineering and space research**.
- Seismic imaging also supports subsurface mapping for **oil and gas exploration**.

Conclusion:

Thus, HPC is becoming an essential **national knowledge infrastructure**, converting complex data into actionable insights for governance while accelerating research, innovation and strategic technological capability.

G. Internal Security

16. Drug trafficking in Punjab is increasingly intertwined with organised crime, cross-border smuggling and targeted killings. Examine the linkages between narcotics trafficking and organised criminal networks and their implications for India's internal security.

(10 Marks, 150 Words)

Introduction:

Drug trafficking in Punjab connects illicit profits with organised violence and cross-border networks. This **narcotic-crime-terror nexus** transforms a policing challenge into a wider internal-security threat.

Linkages with organised criminal networks:

- **Financial interdependence:** Drug proceeds finance weapons, recruitment and criminal operations, while gangs provide protection and distribution networks.
- **Shared smuggling channels:** Cross-border networks transport narcotics and arms, connecting overseas handlers with local operatives.
- **Targeted violence:** Gangs use killings and intimidation to eliminate rivals, enforce payments and control markets.
- **Transnational coordination:** Foreign-based criminals direct local networks, while hawala channels conceal and transfer illicit proceeds. NIA investigations have documented overlapping terrorist, gangster and drug-trafficking networks.

Implications for internal security:

- **Terror financing:** Criminal revenues and logistical networks can support extremist violence and destabilisation.
- **Weakened governance:** Corruption, witness intimidation and fear undermine policing and public confidence.
- **Social vulnerability:** Addiction damages families and livelihoods, while criminal networks exploit vulnerable youth.
- **Wider insecurity:** Interstate operations and overseas leadership complicate investigation, prosecution and border management.

Conclusion:

India needs coordinated intelligence, financial investigations and stronger border surveillance. Effective prosecution must accompany de-addiction, rehabilitation and community participation.

H. History

17. How did the Russian Revolution influence India's freedom struggle and socio-economic thinking?

(10 Marks, 150 Words)

Introduction:

The **Russian Revolution of 1917** had a major ideological impact on India by demonstrating that an old political order could be overthrown and that workers and peasants could become active political forces.

Impact on India's Freedom Struggle:

- It strengthened **anti-imperialist thinking** by linking colonialism with economic exploitation.
- Socialist and Marxist ideas influenced leaders and revolutionaries such as **M.N. Roy, Bhagat Singh and Jawaharlal Nehru**.
- It encouraged the growth of **communist, trade union and peasant movements** in India.
- The rise of the Soviet Union also gave Indian nationalists an alternative model to Western capitalism and imperialism.

Impact on Socio-economic Thinking:

- It popularised ideas of **land reform, workers' rights, state planning and public ownership**.
- Nehru's exposure to the Soviet experiment strengthened his support for **planned economic development**.
- After Independence, India adopted **Five-Year Plans, a large public sector and a welfare-oriented mixed economy**.
- However, India did not adopt Soviet-style one-party rule and instead combined socialistic goals with **parliamentary democracy**.

Conclusion:

Thus, the Russian Revolution influenced both India's struggle against colonialism and its later development strategy, while India adapted socialist ideas to its own democratic framework.

I. Ethics, Integrity & Aptitude

18. "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)

Introduction:

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.

19. "For Gandhi, ethics was not merely about choosing the right end, but also about adopting the right means." Explain the relevance of this idea to public life and administration.

(10 Marks, 150 Words)

Introduction:

Mahatma Gandhi believed that **means and ends are inseparable**. He compared the **means to a seed and the end to a tree** - an unjust method cannot produce a genuinely just outcome. Hence, **Satya (truth) and Ahimsa (non-violence)** had to guide both objectives and actions.

Relevance to Public Life and Administration:

- **Integrity:** Public officials must achieve policy objectives without corruption, manipulation or illegality.
- **Rule of law:** Even desirable outcomes cannot justify arbitrary or unconstitutional methods.
- **Transparency:** Decisions should be taken through open and accountable procedures.

- **Democratic governance:** Political goals should be pursued through dialogue, persuasion and constitutional methods rather than coercion.
- **Compassion:** Administrative efficiency should not come at the cost of human dignity.
- **Public trust:** Ethical means strengthen the legitimacy and credibility of institutions.

For example, controlling crime through **lawful investigation and due process**, rather than custodial violence, reflects Gandhian ethics.

Conclusion:

Thus, Gandhian ethics reminds administrators that **good governance is not only about what is achieved, but also about how it is achieved**. Ethical means make public action both effective and morally legitimate.

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