

**GS PAPER III SCIENCE AND TECHNOLOGY****Artificial Intelligence in Military and Defence**

As nations worldwide increasingly integrate artificial intelligence into their military capabilities, India has emerged as a significant participant in this technological transformation.

Artificial Intelligence

Artificial Intelligence (AI) is a broad field of computer science focused on creating machines capable of performing tasks that typically require human intelligence.

**India's Progress in Use of AI in Defence**

- **India's Defense Budget and Focus on AI Modernization:** India allocated **Rupees 6.21 lakh crore (\$75 billion)** to its defense budget last year, with a significant emphasis on modernizing its military capabilities.
- **Government Emphasis on AI's Role in Military Operations:** The Union Defence Minister, has highlighted the transformative potential of AI in military operations.
- **AI Innovations in India's Defense Sector:** India has made notable progress in developing and deploying AI-enabled systems, such as Indrajal Autonomous Drone Security System.
  - The **Indrajal system is an AI-powered, autonomous drone defense system** developed by Grene Robotics, a Hyderabad-based company.
  - **Indian Army:** The Indian Army has deployed Artificial Intelligence (AI) surveillance systems along its borders with Pakistan and China.
  - **Air Force:** The Air Force is adopting AI to improve mission planning and execution, focusing on **unmanned aerial vehicles (UAVs) and autonomous systems**.
    - Further, the Air Force has also established the **Center of Excellence for Artificial Intelligence (CoEAI)** at **Air Force Station Rajokri, New Delhi** under the **Unit for Digitisation, Automation, Artificial Intelligence and Application Networking (UDAAN)** initiative.
  - **Indian Navy:** The Navy is exploring AI for **maritime surveillance and threat detection**, using machine learning algorithms to analyze vast amounts of data from various sensors and platforms.
- **Attracting Foreign Investments in AI:** India's AI ecosystem has gained global attention, leading to significant foreign investments:
  - **Microsoft's Commitment:** The company has invested approximately \$3 billion to build data centers in Telangana, bolstering India's AI infrastructure.
  - **International Collaborations in AI Development:** India actively participates in international partnerships aimed at advancing AI technologies, especially for military applications.
    - These collaborations reflect India's commitment to keeping pace with global developments in military AI.

**Key Challenges Faced by India in the use of AI in Defence:**

Despite this progress, several challenges hinder India's full utilization of AI in defense:

- **Data and Funding:** Limited digitized data for training AI systems and the high cost of data centers pose significant obstacles.
- **Policy Gaps:** While India has outlined national AI strategies and principles for responsible AI, **specific guidelines for military AI deployment and regulation are lacking**.
- **Inter-Service Interoperability Issues:** The separate doctrines, systems, and communication practices of the Indian Army, Navy, and Air Force create interoperability challenges and complicate the procurement of systems for joint operations.
- **Over-reliance on Public Sector Units (PSUs):** While PSUs play a role, limiting defense procurement primarily to them hinders innovation and access to advanced systems developed by private companies and startups.
  - Private sector startups and enterprises, which are better equipped to develop cutting-edge AI solutions, remain underutilized.
- **Cybersecurity Vulnerabilities and Hacking Risks:** AI systems are susceptible to cyberattacks, such as data breaches, adversarial inputs, and hacking attempts.
- **Ethical and Security Concerns:** Autonomous AI systems raise accountability issues, particularly in the context of decisions with lethal consequences.
  - Ethical questions about bias in AI systems and their impact on human rights are yet to be fully addressed.
- **Exploitation of Generative AI by Terrorist Groups:** Terrorist Groups can use AI to spread fake images/videos to manipulate emotions and influence behavior.
  - **Hamis-affiliated groups** have used AI-generated images in the **recent Gaza conflict** to spread misinformation.

## Way Forward

### To fully leverage AI in defense, India needs to:

- **Develop Robust Frameworks:** Establish clear policies and regulations specifically for military AI deployment and ethical use.
- **Promote Inter-Service Collaboration:** Break down silos between the armed forces to ensure interoperability and effective joint operations.
- **Encourage Public-Private Partnerships (PPPs):** Foster collaboration with private companies and startups to drive innovation and access cutting-edge technologies.
- **Foster International Cooperation:**
  - **Engage in international dialogues:** Participate in international discussions and collaborations on AI in defense to share best practices and address common challenges.
- **Enhance Research and Development (R&D):**
  - **Increase R&D funding:** Allocate more resources to AI research and development in the defense sector.
  - **Foster collaboration between academia, industry, and government:** Create platforms for collaboration and knowledge sharing between research institutions, private companies, and defense organizations.
  - **Promote indigenous AI development:** Encourage the development of indigenous AI technologies to reduce reliance on foreign sources and ensure strategic autonomy.
- **Emphasize Ethical Considerations:**
  - **Develop ethical guidelines for military AI:** Establish clear ethical principles and guidelines for the development and deployment of AI in military applications, including the use of lethal autonomous weapons.
  - **Ensure human oversight:** Maintain human control over critical decisions, especially those involving the use of force.
  - **Promote transparency and accountability:** Ensure transparency in the development and deployment of AI systems and establish mechanisms for accountability.

## Conclusion

As India embraces the potential of AI in defense, the focus should remain on fostering an environment that encourages innovation while addressing ethical and operational challenges. The integration of AI technologies into the armed forces not only promises enhanced national security but also positions India as a leader in the global defense landscape.

## GS PAPER 3- INDIAN ECONOMY

### Legal Guarantee for MSP

The article addresses the contentious debate surrounding the demand for a legal guarantee of Minimum Support Price (MSP) for farmers. The article is a direct rebuttal to economist Ashok Gulati's critique of the demand, presenting a detailed defense of the need for an assured MSP mechanism to support Indian farmers. The context is deeply rooted in the ongoing farmers' movement and broader debates on agricultural reforms, market liberalization, and state intervention.

### **What is the debate around MSP?**

1. The debate revolves around whether a legal guarantee for Minimum Support Price (MSP) is feasible and necessary.
2. While critics argue it may distort markets and is incompatible with economic liberalization, proponents believe it is crucial to ensure fair prices for farmers and counterbalance systemic biases in agricultural policies.

### **Why is MSP important for farmers?**

1. MSP ensures a minimum price for crops, offering financial security to farmers.
2. Farmers often do not realize the announced MSP due to market dynamics and lack of effective implementation.
3. Proponents argue it addresses an unwritten social contract between the state and farmers, especially in a poor, democracy-driven country where food prices cannot rise unchecked.

### **What are the key criticisms against a legal guarantee for MSP?**

Economist Ashok Gulati and others argue:

1. Legal MSP would distort agricultural markets and hinder price discovery.
2. It could promote collusion between farmers and traders.
3. Freer, less interventionist markets are viewed as a better alternative for sustainable growth.

### **How have proponents addressed these criticisms?**

Supporters of legal MSP, including farmer activists, propose nuanced mechanisms:

1. **Expanding Procurement:** Widen the food basket in the Public Distribution System (PDS) and increase procurement levels at MSP.
2. **Market Intervention:** Create targeted schemes to prevent prices from falling below MSP.

3. **Balanced Trade Policies:** Adjust import-export policies to prevent price suppression in domestic markets.
4. **Price Deficit Payments (PDP):** Compensate farmers for the difference between the market price and MSP, without relying on traders' receipts to prevent collusion.

**What examples support or refute MSP's effectiveness?**

1. **Critics' View:** Sectors like fishery, meat, poultry, and horticulture, which lack MSP, have grown rapidly due to changing consumer preferences and export opportunities.
2. Critics suggests:
  - Establishing a price stabilization fund for pulses and oilseeds.
  - Allowing freer market mechanisms to address price discovery and growth.
3. **Proponents' View:** MSP-supported crops like mustard (82% growth) and green gram (113% growth) have outperformed horticulture (51% growth) and milk (78% growth) in the same period (2011-12 to 2022-23). Growth in non-MSP sectors like milk often doesn't translate to higher incomes for farmers, showing a need for state intervention.

**What would be the cost of implementing a legal MSP?**

Based on 2022-23 calculations:

1. Current MSP levels: Rs. 26,565 crore (0.6% of the budget and 0.1% of GDP).
2. Revised MSP (C2+50%): Rs. 1,68,227 crore (4.26% of the budget and 0.62% of GDP).
3. These costs are modest compared to Rs. 2.08 lakh crore written off by public sector banks and Rs. 1.09 lakh crore corporate tax waivers in the same year.

**What is the way forward for MSP implementation?**

1. Critics need to offer concrete solutions for making MSP "effective" beyond opposing legal guarantees.
2. A balanced approach combining market mechanisms and state intervention could address systemic biases against farmers.

**GS PAPER 3- SCIENCE AND TECHNOLOGY**

**Genome India Project**

The article highlights the significance and scope of the Genome India Project, an ambitious national initiative aimed at creating a comprehensive genetic map of India's diverse population. Launched in 2020 by the Department of Biotechnology, this project involves sequencing the genomes of 10,000 individuals from 99 distinct ethnic groups in its initial phase. The effort is driven by India's rich genetic diversity, comprising over 4,600 distinct populations, which is both a scientific asset and a challenge.

**What is the Genome India Project?**

1. The Genome India Project is an initiative launched by the Department of Biotechnology in 2020 to map India's genetic diversity.
2. It involves sequencing the genomes of 10,000 healthy individuals from 99 ethnic populations, creating a baseline map of India's genetic variations.
3. The project aims to expand and sequence up to 1 million genomes in the future.

**What is genome sequencing?**

1. Genome sequencing deciphers the complete set of genetic instructions (DNA) in an organism.
2. The human genome comprises 3 billion base pairs represented by A, C, G, and T. Researchers extract genetic material from samples like blood, break it into smaller pieces, and sequence them.
3. These pieces are then reassembled to create the complete genome, much like assembling numbered parts of furniture.

**Why does the Genome India Project matter?**

1. **Disease research and therapies:** It helps identify genetic risk factors for diseases and enables the development of therapies targeting specific genes.
2. **Discovery of new genetic variants:** Identified 135 million genetic variations, including 7 million unique to India. These variants are not present in global databases, highlighting India's genetic uniqueness.
3. **Population-level insights:** It determines the frequency of disease-causing mutations. Example: The MYBPC3 mutation, leading to early cardiac arrest, is found in 4.5% of Indians but is globally rare.
4. **Rare disease identification and gene therapy development:** Unveils mutations like LAMB3, found in 4% of a population near Madurai, causing lethal skin conditions.
5. **Drug resistance and precision medicine:** Identifies genetic resistance to medicines or anaesthetics, like in South India's Vaishya community, where certain anaesthetics can cause severe complications.

**What will the second phase of the Genome India Project involve?**

The second phase will focus on sequencing genomes of individuals with specific diseases to compare with healthy genomes. This will help:

1. Identify genetic causes or predispositions for diseases such as cancer, diabetes, and neurological disorders.
2. Study genetic changes associated with diseases.
3. Develop targeted therapies and diagnostic tools for rare diseases found in Indian populations.

**How will the data be shared?**

The genomic data will be available to Indian researchers through managed access:

1. Only research institutions collaborating with the Department of Biotechnology will have access.
2. Scientists must submit proposals and receive government funding.
3. The data will be double-blinded to ensure anonymity: Samples are encoded at collection and further encoded when shared.

**How does the Genome India Project compare to global efforts?**

1. The **Human Genome Project** (2003) was the first global initiative to sequence the entire human genome.
2. Other projects include:
3. **1,000 Genomes Project (2012)**: Sequenced 1,092 genomes.
4. **UK's 100,000 Genomes Project (2018)**: Focused on health-related genome research.
5. **European 1+ Million Genomes Initiative**: Aimed at sequencing genomes across 24 countries.
6. The Genome India Project is a critical step toward addressing India's unique genetic diversity and public health challenges.

**GS PAPER I - SOCIETY - SOCIAL EMPOWERMENT**

**Engaging Men to End Violence Against Women**

The article highlights the need to engage men in ending violence against women by challenging harmful masculinity norms. It discusses UNESCO's *Transforming MENTALities* initiative and a report documenting Indian programmes promoting equality, empathy, and non-violence through education and dialogues.

**Why is violence against women a "men's issue"?**

1. **Men as Perpetrators and Agents of Change**: Nearly one in three women globally face violence from men, highlighting men's role in both perpetuating and addressing the issue.
2. **Harmful Masculinity Norms**: Boys are conditioned to equate strength with dominance and see emotions as weakness. This leads to aggressive behaviors and limits healthy relationships.
3. **Impact on Men's Lives**: Toxic masculinity traps men in cycles of suppressed emotions and aggressive behaviors, affecting their relationships and personal growth.

**What does UNESCO's report on India highlight?**

1. UNESCO's *Transforming MENTALities* initiative emphasizes engaging men as active participants in promoting gender equality.
2. The report, *Engaging Men and Boys: Pathways to Gender Equality in India*, documents 10 pioneering programmes addressing gender inequality. These programmes encourage dialogues to challenge traditional gender norms and promote positive masculinities.
3. Some of the interventions are:
  - **Mardon Wali Baat** uses storytelling and social media to help young men critically examine limiting narratives, promoting values like respect and equality.
  - **Gender Equity Movement in Schools (GEMS)** engages boys in Rajasthan through interactive activities. One boy stated, "Boys should also work at home."
  - Initiatives like **Dekh Rekh** and **Hamari Shaadi** tackle everyday gender bias by encouraging men to participate in family nutrition and planning.

**What role do role models play?**

1. Positive male role models who share caregiving duties, reject violence, and show empathy inspire change.
2. Public figures like a famous Indian cricketer, who took paternity leave, promote shared responsibilities and equitable relationships.

**What is the way forward?**

Men must reject harmful stereotypes and actively contribute to gender equality. By questioning patriarchal privileges and embracing equality, men can help build a world free from violence where everyone thrives. Let us celebrate men transforming mentalities and championing equality.

**PRELIM FACTS**

**1.e-Oath Against Drugs**

A de-addiction drive launched in Rajasthan's Sriganganagar district yielded positive results by mobilising the youth. About 1.25 lakh people took an e-oath against the consumption of narcotic substances during the campaign.

**About e-Oath against drug usage:**

- **What it is:**
  - An innovative digital initiative that allows individuals to take an online pledge against drug consumption.
  - A dedicated web portal and QR codes pasted across public places facilitate easy participation.
- **Significance:**
  - Promotes community-driven de-addiction efforts by involving individuals at scale.
  - Encourages youth to avoid narcotics, improving societal well-being and stability.

- Demonstrates the power of IT-based solutions in tackling social challenges.
- Engages schools, colleges, villages, and hospitals to amplify awareness.

## 2.Nag Mk-2

The Defence Research and Development Organisation (DRDO) announced that the indigenously developed third-generation fire-and-forget anti-tank guided missile, Nag Mk-2.

### **About Nag Mk-2 Anti-Tank Guided Missile:**

- **What it is:** Nag Mk-2 is a third-generation, indigenously developed **fire-and-forget anti-tank guided missile** designed to neutralize modern armoured threats.
- **Developed by:** The missile was developed by the **Defence Research and Development Organisation (DRDO)** under India's Integrated Guided Missile Development Programme (IGMDP).
- **Key Features:**
- **Fire-and-Forget Technology:** Operators can lock onto targets before launch, ensuring precision strikes in complex battlefield conditions.
- **Versatility:** Capable of defeating modern armoured threats, including those equipped with Explosive Reactive Armour (ERA).
- **Effective Range:** Validated performance for both maximum and minimum range during trials.
- **Platform Integration:** Designed for multiple platforms, including the Nag Missile Carrier (NAMICA) for greater operational flexibility.
- **Advanced Guidance Systems:** Equipped with advanced imaging infrared (IIR) seekers for improved accuracy in day and night conditions.
- **Significance:**
- **Indigenous Defence Capability:** Strengthens India's defence self-reliance by reducing dependency on foreign imports.
- **Enhanced Battlefield Readiness:** Provides the Indian Army with a cutting-edge weapon system to counter armoured threats.
- **Operational Effectiveness:** Pinpoint accuracy ensures neutralisation of targets with minimal collateral damage.
- **Strategic Deterrence:** Demonstrates India's technological advancements in missile systems to adversaries.

## 3.Mission Mausam

On the occasion of the 150th Foundation Day of the India Meteorological Department (IMD), Prime Minister launched "Mission Mausam," a transformative initiative aimed at enhancing India's weather forecasting and climate resilience capabilities.

### **About Mission Mausam:**

- **What it is:** Mission Mausam is a comprehensive program to modernize India's weather and climate monitoring infrastructure, focusing on advanced technologies for atmospheric observations and data analysis.
- **Ministry/Department:** Ministry of Earth Sciences (MoES) and India Meteorological Department (IMD).
- **Aim:**
  - To make India a weather-ready and climate-smart nation.
  - To enhance weather forecasting accuracy and support climate change mitigation efforts.
- **Key Features**
  - **Advanced Infrastructure:** Deployment of next-generation radars, satellites, and high-performance computing systems for real-time atmospheric monitoring
  - **Improved Forecasting:** Strengthening weather and climate prediction models with high-resolution data for accurate short and long-term forecasts.
  - **Air Quality Monitoring:** Enhanced air quality data collection for environmental interventions and weather management strategies.
  - **Sectoral Benefits:** Direct benefits to agriculture, disaster management, aviation, defence, energy, and health sectors.
  - **Vision-2047 Alignment:** Complementing the IMD Vision-2047 roadmap for climate adaptation and resilience.

## 4.Rat-Hole Mining

Recently, the tragic loss of lives in a flooded rat-hole coal mine in Assam's Dima Hasao district reignited the debate on the persistence of illegal mining and its consequences.

### **About Rat-hole Mining:**

- **What it is:** Rat-hole mining involves digging narrow tunnels, barely large enough for workers to crawl in, to extract coal seams. It is of two types:
  - **Side-cutting mining** on hill slopes to follow visible coal seams.

- **Box-cutting mining** where deep pits are dug, and horizontal tunnels are made.
- **Why it persists in India:**
  - **Economic Incentives:** Workers earn significantly more compared to farm or construction work.
  - **Local Control:** In Sixth Schedule areas like Meghalaya, landowners also own the minerals, making regulation challenging.
  - **Lack of Modern Techniques:** High costs and terrain complexities discourage mechanized mining.
  - **Poor Governance:** Weak enforcement and alleged official complicity allow illegal mining to flourish.
- **NGT Ban:** Imposed in 2014 to prevent environmental degradation and protect lives.
- **Why Northeast India has more rat-hole coal mines:**
- **Sixth Schedule Land Rights:** In states like Meghalaya, tribal communities own land and minerals, making it difficult for government regulations to enforce mining standards effectively.
- **Thin Coal Seams:** The coal deposits in Northeast India are narrow and shallow, making large-scale mechanized mining economically unviable and favoring primitive rat-hole techniques.
- **Challenging Terrain:** The hilly and rugged topography of the region restricts the use of modern mining machinery, leading to reliance on manual methods like rat-hole mining.
- **High Demand and Local Economy:** Rat-hole mining provides quick profits and employment for local communities, driven by demand from nearby industries like cement and thermal power plants.

### 5.Sada

The unique flat-top landscapes called *sada*, located in the Konkan region of Maharashtra, are rich in biodiversity and cultural significance.

#### **About Sada:**

- **What it is:** Flat-top plateaus formed by centuries of erosion, locally called *sada*, meaning a large flat area.
- **Located in:** Found in the Konkan region of Maharashtra, particularly in Ratnagiri district, between the Arabian Sea and the Western Ghats.
- **How they are established:** Created due to geological weathering of lateritic soil and erosion processes over centuries.
- **Other names:** Similar to *pathar* plateaus, such as the Kaas Plateau in Satara district.
- **Geographical features:**
  - Rocky terrain with lateritic soil, transforming into lush biodiversity hubs during monsoons.
  - Serve as freshwater catchments due to their unique geology.

### 6.Diego Garcia Island

Fifteen fishermen from Kanniyakumari, Tamil Nadu, were detained near Diego Garcia Island, part of the British Indian Ocean Territory (BIOT), for allegedly crossing maritime boundaries.

#### **About Diego Garcia Island:**

- **Located in:** Central Indian Ocean, part of the Chagos Archipelago.
- **Controlled by:** British Indian Ocean Territory (BIOT), leased to the United States for a military base.
- **Features:**
  - A coral atoll with a V-shaped cay and an open lagoon at its northern end.
  - Discovered by the Portuguese in the 16th century.
  - Strategic air and naval base for the U.S.
  - Located in the **south of the equator**.

#### **About Chagos Archipelago:**

- **Located at:** Central Indian Ocean, south of the Maldives.
- **Controlled by:** British Indian Ocean Territory (BIOT), with claims by Mauritius.
- **Disputed between:** United Kingdom and Mauritius, with the International Court of Justice (ICJ) ruling in favor of Mauritius' decolonization claim in 2019.
- **Features:**
  - Consists of more than 50 islands, including Diego Garcia.
  - Known for its ecological significance and strategic military value.
  - Located in the **south of the equator**.

### **ANSWER WRITING**

**Q. "India has begun harnessing AI's potential to strengthen its defence ecosystem, but significant impediments remain". Examine the specific challenges faced by India and propose effective measures to address them.**

Artificial Intelligence (AI), the simulation of human intelligence in machines, is transforming defense systems globally. India, too, has leveraged AI for surveillance, cybersecurity, and autonomous weaponry. For instance, the Indian Army recently adopted AI-based surveillance systems. However, challenges like technological dependency, inadequate infrastructure, and ethical concerns hinder progress. Addressing these issues is crucial for a robust AI-enabled defense ecosystem.

**How India has begun harnessing AI's potential to strengthen its defence ecosystem**

- **Integration of AI in defence systems::** India has developed AI-based products like **Indrajaal**, an autonomous drone security system for enhancing border security and military operations.  
**For example:** The Indrajaal system can counter aerial threats such as **drones, UAVs, and loitering munitions** using AI and machine learning.
- **Global collaborations in AI:** India participates in global AI initiatives, such as the **Global Partnership on Artificial Intelligence (GPAI)**, to promote AI development and adoption.  
**For example:** GPAI facilitates international cooperation to align AI ethics, research, and deployment, enabling India to access global best practices in military AI.
- **Foreign investments in AI infrastructure:** India attracts foreign investments like **Microsoft's \$3 billion commitment** to building data centres in Telangana, strengthening AI development capabilities.  
**For example:** These data centres provide computational power to train AI models for defence applications, improving efficiency and innovation.
- **Creation of AI-focused defence agencies:** Establishment of **Defence Artificial Intelligence Council (DAIC)** and **Defence AI Project Agency (DAIPA)** aims to institutionalize AI deployment in defence.
- **Government emphasis on AI's potential:** Defence Minister highlights AI's role in revolutionising military operations, from predictive analytics to autonomous decision-making systems.  
**For example:** AI-based **predictive analytics** can anticipate enemy movements, enabling proactive defence strategies and better resource allocation.

**Specific challenges faced by India in harnessing AI's potential to strengthen its defence ecosystem**

- **Lack of digitised data for AI training:** India's defence systems have limited digitised data to train AI models, hindering effective deployment in critical operations.  
**For instance:** AI models need **diverse datasets** for accuracy, but legacy systems lack proper documentation and digitised records.
- **Fragmented AI policies:** India's **National Strategy for Artificial Intelligence** lacks clear guidelines for deployment, especially for military-specific AI applications.  
**For example:** While it outlines broad principles, it provides no **actionable framework** for integrating AI in defence procurement or operations.
- **Siloed armed forces:** The **Indian Army, Navy, and Air Force** operate independently, impeding inter-service communication and joint AI system implementation.  
**For example:** Separate doctrines hinder **interoperability**, as seen in challenges coordinating AI-based intelligence during joint military exercises.
- **Reliance on public sector units (PSUs):** PSUs dominate defence manufacturing, limiting private sector innovation and scalability in AI-driven technologies.  
**For example:** Unlike the space sector's PPP model, defence AI adoption remains constrained by PSUs' **slower development** processes.
- **High costs of AI infrastructure:** AI systems require expensive data centres and computational resources, competing with funds needed for upgrading legacy defence hardware.  
**For example:** Replacing outdated aircraft like **MiG-21** takes precedence, diverting resources away from developing **critical AI infrastructure**.

**Effective measures to address these challenges**

- **Digitisation of defence data:** Implement a nationwide program to digitise legacy defence data and integrate it into secure AI training platforms.  
**For example:** The **US's Project Maven** uses digitised combat data to train AI models for image recognition in drones.
- **Formulation of robust AI policies:** Develop clear and detailed military AI deployment policies with a focus on accountability, transparency, and ethical considerations.  
**For example:** **Israel's AI policies** streamline development by defining specific use cases, ensuring rapid deployment of advanced technologies.
- **Strengthening inter-service collaboration:** Establish a unified command structure for AI systems to enable interoperability across the Army, Navy, and Air Force.  
**For example:** The **US Department of Defense's Joint AI Center** coordinates AI strategies across all branches of the military.
- **Encouraging public-private partnerships (PPPs):** Facilitate collaborations between PSUs, private companies, and startups to harness innovation and scalability in defence AI technologies.  
**For example:** **ISRO's collaboration with startups** for satellite launches demonstrates the success of PPP models in high-tech sectors.

- **Increased AI-specific defence budgets:** Allocate dedicated funds for AI infrastructure and R&D, reducing reliance on foreign technologies and ensuring self-reliance.

To fully harness AI's potential in defense, India must prioritize investments in R&D, foster public-private partnerships, and enhance cybersecurity frameworks. Addressing challenges like data privacy, talent gaps, and ethical concerns requires targeted policies and global collaborations. A future-ready defense ecosystem, powered by AI, will ensure India's strategic edge while maintaining ethical and operational accountability.

**MCQ**

- Which of the following properties of pink fire retardant primarily contributes to its effectiveness in wildfire suppression?
  - High water retention capacity
  - Reflective properties to reduce heat absorption
  - Thermal insulation of vegetation
  - Oxygen-blocking chemical coating**
- Consider the following statements about De-notified Tribes (DNTs):
  - They were denotified after the Criminal Tribes Act was repealed.
  - The Idatte Commission recommended a sub-quota for DNTs under the SC/ST/OBC categories.
  - All De-notified Tribes in India are classified under the Scheduled Tribes (ST) category.

How many of the above statements is/are incorrect?

  - Only one**
  - Only two
  - All three
  - None
- Consider the following statements about the Hoollongapar Gibbon Wildlife Sanctuary:
  - It is situated along the Brahmaputra River in Assam.
  - The sanctuary is home to India's only ape species, the Hoolock Gibbon.
  - It is a natural habitat for nocturnal primates like the Bengal Slow Loris.

How many of the above statements is/are correct?

  - Only one
  - Only two**
  - All three
  - None
- Consider the following statements about the environmental significance of bacterial plasticizer degradation:
  - It reduces carcinogenic plasticizer contamination in water bodies.
  - It prevents the release of microplastics into the environment.
  - It supports the development of biotechnological solutions for waste management.
  - It eliminates all harmful by-products of plastic degradation.

How many of the above statements is/are correct?

  - Only one
  - Only two
  - Only three**
  - All four
- What is the primary astronomical factor that determines the timing of the Maha Kumbh Mela?
  - Conjunction of the Sun, Moon, and Mars
  - Alignment of the Sun, Moon, and Jupiter in specific zodiac signs**
  - Position of Venus in relation to the Moon
  - The movement of the Earth around its perihelion
- Consider the following statements about the health and environmental impacts of groundwater contamination:
  - Excess fluoride leads to skeletal fluorosis.
  - Nitrate contamination can cause algal blooms in aquatic ecosystems.
  - Arsenic exposure is associated with kidney damage and skin lesions.
  - Uranium contamination is primarily a result of urban wastewater discharge.

How many of the above statements is/are correct?

  - Only one
  - Only two
  - Only three**
  - All four
- Sada is a type of flat, rocky terrain found in the Konkan region of Maharashtra. Which one of the following types of bio-diversities is found in the region?
  - Dense evergreen forests with tall trees
  - Mangrove ecosystems adapted to saline conditions
  - Species adapted to arid and nutrient-poor environments**
  - Extensive aquatic biodiversity in freshwater lakes
- Consider the following statements:
  - Diego Garcia island has the world's largest coral reef.
  - Diego Garcia is currently administered as part of British Indian Ocean Territory.

Which of the statement(s) given above is/are correct?

  - 1 only
  - 2 only**
  - Both 1 and 2
  - Neither 1 nor 2
- With reference to 'Sada landscapes', consider the following statements:
  - These are lateritic flat tops in the konkan region of western ghats formed by centuries of erosion.
  - They are barren most of the year but they flourish with endemic flora during monsoons.

Which of the statements given above is/are correct?

  - 1 only
  - 2 only
  - Both 1 and 2**
  - Neither 1 nor 2
- Which of the following factors have contributed to the recent fall of the Indian Rupee against the US Dollar?
  - Decrease in US interest rates
  - Increase in global oil prices
  - Reduction in India's export demand
  - Strengthening US Dollar

Select the correct answer using the codes given below:

  - 1 and 2 only
  - 2 and 4 only**
  - 3 and 4 only
  - 1, 2, and 4 only