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ARTIFICIAL INTELLIGENCE IN INDIA

SYLLABUS:

GS 3 > Science and Technology

REFERENCE NEWS:

As Artificial Intelligence (AI) transforms work and industries globally, India must ensure women are central to this technological shift especially as entrepreneurs, innovators, and decision-makers. Insights from the UN Women × LinkedIn brief show that **80% of Indian women work in jobs that are either "augmented" or "disrupted" by AI**, making them more vulnerable to displacement compared to men who move into more tech-augmented roles.

- To ensure women benefit from this shift, India must invest in **AI literacy, reskilling, and accessible training** through universities, career centres, and entrepreneurship networks.
- While women-owned businesses are rising, they still receive **less than 2% of venture funding**, signalling the need for inclusive financing grants, first-loss capital, cloud credits, AI tools, and mentorship.
- LinkedIn's SMB Research 2025 shows women-led SMEs are **early adopters of AI, more optimistic, and hire based on skills**, using digital platforms for hiring, marketing, and growth.
- Supporting women with **credit access, AI training, and market linkages** can create a multiplier effect for innovation and employment, aligning with Startup India, Digital India, and the Viksit Bharat vision.
- True inclusion also requires women in **AI governance, ethics, data privacy, and policy-making** roles.

STATUS OF ARTIFICIAL INTELLIGENCE (AI) IN INDIA, THE CURRENT LANDSCAPE:

India is witnessing a **rapid and unprecedented expansion of its Artificial Intelligence ecosystem**, driven by massive public investment, growing private innovation, and expanding digital infrastructure.

- **Strong Government Push: AI as a National Priority**
  - **IndiaAI Mission:** India has deployed **38,000 GPUs**, far exceeding the initial target of 10,000 making **world-class AI compute accessible at ₹65 per hour**.
  - **Seven Pillars of IndiaAI Mission i**ncludes: IndiaAI Compute (GPUs), Application Development, AIKosh (3,000+ datasets, 243 models), Foundation Models, FutureSkills (13,500 scholars

supported), Startup financing, Safe & Trusted AI. This is helping India build **sovereign AI capability**.

- **Expanding AI Economy**
  - **6 million people** employed in the tech and AI ecosystem.
  - Tech sector revenue predicted to cross **USD 280 billion** this year.
  - AI can add **USD 1.7 trillion** to India's economy by **2035**, becoming a key GDP accelerator.
- **Start-up ecosystem**
  - India now has **1.8 lakh startups**.
  - **89% of new startups** launched last year use AI in some form
  - Women-led digital businesses show **higher AI adoption** (LinkedIn SMB Research 2025).
- **Global Recognition & Growing Capabilities**
  - As per the **Stanford AI Index**, India is among top **4 countries** in AI skills, capabilities, and policy frameworks. India is the **2nd-largest contributor** to AI projects on GitHub.

SIGNIFICANCE OF AI IN INDIA:

Direct boost to GDP, productivity & value creation

- The tech and AI ecosystem in India already employs **over 6 million people**, with the tech sector projected to cross **USD 280 billion** in revenue this year.
- AI alone is estimated to add **USD 1.7 trillion to India's economy by 2035**, making it one of the biggest single drivers of future GDP.

Sectoral transformation: AI as a growth multiplier

- **Industry & services:** India hosts **1,800+ Global Capability Centres (GCCs)**, including **500+ focused on AI**. On the NASSCOM AI Adoption Index, India scores **2.45/4**, with **87% of enterprises actively using AI**, and **26% of companies at AI maturity at scale**.
  - Leading AI-using sectors **industrial & automotive, consumer goods & retail, BFSI, and healthcare** account for **around 60% of AI's total value** in India.
- **Agriculture & rural economy:** AI tools are being used for **Weather prediction, pest detection, irrigation and sowing decisions**.
  - Programmes like **Kisan e-Mitra** help farmers access schemes such as **PM-Kisan**.
  - **National Pest Surveillance System** and **Crop Health Monitoring** combine satellite data, weather inputs and soil analysis for real-time advice.
- **Healthcare:** AI helps doctors **detect diseases early**, analyse scans and recommend personalised treatment.
  - **Telemedicine** + AI lets rural patients consult specialists in big hospitals without travel.
  - India participates in **HealthAI** and ICMR–IndiaAI collaborations with the UK and Singapore to ensure **safe and ethical AI in health**.
- **Education & skilling:** Under **NEP 2020**, CBSE offers a **15-hour AI module from Class VI and o**ptional AI subject from **Class IX–XII.**
  - **DIKSHA** uses AI for search, accessibility and read-aloud features, especially for visually impaired students.
  - **YUVAi** trains students (Classes 8–12) to build AI solutions across themes like agriculture, health, environment and justice.

- **Start-up ecosystem & innovation-led growth:** India has **around 1.8 lakh startups**, and **nearly 89% of new startups launched last year use AI** in their products or services.
    - The **IndiaAI Startup Financing** pillar and **IndiaAI Startups Global Acceleration Programme** (with Station F & HEC Paris) help Indian AI startups access capital, markets and global networks.
    - **BharatGen AI**, the first government-funded multimodal LLM supporting **22 Indian languages**, and platforms like **AIKosh** (3,000+ datasets, 243 models) provide shared infrastructure for innovators.
    - **Sarvam AI** is building India's sovereign LLM ecosystem and working with UIDAI to make **Aadhaar services smarter and more secure**.

Jobs, skills & new occupations

- AI isn't just automating tasks; it's **creating new job families**: NASSCOM's "Advancing India's AI Skills" (2024) projects India's AI talent base will grow from **6–6.5 lakh to 12.5 lakh** by **2027** (15% CAGR).
- As of August 2025: **8.65 lakh candidates** have enrolled/trained in emerging tech courses, including **3.20 lakh in AI and Big Data Analytics**.
    - Under **FutureSkills PRIME**, **18.56 lakh** signed up; **3.37 lakh** completed courses.
    - The **IndiaAI FutureSkills** pillar supports **500 PhD fellows, 5,000 postgraduates, 8,000 undergraduates**, with AI/Data Labs being set up in **Tier-2 and Tier-3 cities** and ITIs.

Inclusion & productivity of informal workers

- NITI Aayog's **AI for Inclusive Societal Development (Oct 2025)** focuses on **490 million informal workers**.
- It envisions AI plus IoT, blockchain, robotics, and immersive learning to overcome **language & literacy barriers** (voice-first AI), enable **smart contracts** for timely, transparent payments, provide **micro-credentials and on-demand learning** so workers can upskill continuously.
- The core implementation engine is the **Digital ShramSetu Mission**, designed to deploy frontier tech at scale for informal workers via pilots, then nationwide rollout (2029 onwards).

Governance, transaction costs & business climate

- AI is also an **economic enabler** through better governance **e-Courts Phase III** uses AI/Machine language for translation, scheduling and case management. Translating judgments into regional languages via **AI Translation Committees** and platforms like **e-HCR and e-ILR** increases legal access and reduces delays.
- **Bhashini** supports **20 Indian languages**, integrates **350+ AI models**, and has **450+ customers**, helping citizens and businesses access digital services in their own language.
- AI-based weather models and the upcoming **MausamGPT** help farmers, logistics players and disaster managers plan better.

Global competitiveness & strategic positioning

- India is ranked among the **top 4 countries** in AI skills and capabilities and is the **second-largest contributor** to AI projects on GitHub.
- The upcoming **India AI Impact Summit 2026** will host **AI Pitch Fest (UDAAN)**, focusing on women and differently-abled founders. Feature **300+ exhibitors** from India and **30+ countries**.

CHALLENGES OF AI IN INDIA:

- **Limited High-End Compute Infrastructure :** Although the IndiaAI Mission has now deployed **38,000 GPUs**, the demand from startups, GCCs, and research institutions is much higher. Global AI leaders operate with **hundreds of thousands of GPUs**, giving them scale and speed that India is still catching up to.
- **Shortage of Advanced AI Talen:** India's AI talent pool is growing but still limited
  - AI workforce: **6–6.5 lakh**, projected to reach **12.5 lakh by 2027** → still inadequate for a population this size.
  - Only **26% of enterprises** have achieved AI maturity at scale.
  - Tier-2 and Tier-3 cities lack strong AI research ecosystems.
- **High Dependence on Foreign AI Models & Chips:** India imports most AI chips (GPUs), hardware, and even foundational algorithms. Indigenous foundational models (e.g., Sarvam AI, BharatGen AI) are emerging but still at early stages. Vulnerability to supply-chain shocks, export restrictions, geopolitical risks.
- **Data Challenges: Quality, Fragmentation & Accessibility:** India has massive data, but it is **unstructured**, **siloed across ministries**, and often **lacks labelling or standardisation**.
  - AIKosh has **3,000+ datasets**, but many sectors still lack machine-readable public data.
  - Privacy concerns and the absence of a unified data sharing framework create regulatory uncertainty.
- **Skill Gaps Across Workforce & Weak AI Literacy:** Although NEP 2020 and CBSE have introduced AI modules
  - NITI Aayog identifies **490 million informal workers** at risk of being excluded without targeted skilling
  - FutureSkills PRIME has trained **3.37 lakh** workers, still a fraction of what India needs.
- **Funding Gaps for Women-Led and Small AI Startups:** Less than **2% of venture capital** goes to women-led enterprises. AI infrastructure, even at ₹65/hour, remains expensive for early-stage enterprises.
- **Sectoral Inequity in AI Adoption:** Top sectors BFSI, healthcare, retail drive **60% of AI's value**, while MSMEs, agriculture, and informal sectors lag behind heavily.
  - Rural India lacks digital infrastructure in many regions despite improvements through BharatNet and Bhashini.
- **Regulatory Uncertainty & Ethical Concerns:** India is still developing comprehensive AI governance and safety frameworks. Challenges include algorithmic bias, lack of explainability, privacy risks, job displacement fears.
- **Limited Research Output Compared to Global Leaders:** India ranks top 4 in AI skills & capabilities but still lags in peer-reviewed AI research, patents, high-impact publications, global AI citations. Centres of Excellence exist, but overall R&D spending remains **below 1% of GDP**, far behind China (2.4%) and the US (3.5%).
- **Infrastructure Gaps in Connectivity & Energy:** Continuous AI computation demands stable broadband and power. Many rural regions still suffer from power cuts, limited fibre penetration, weak digital infrastructure.

WAY FORWARD:

Strengthen Compute Infrastructure & Indigenous Chip Development

- Expand IndiaAI Compute to **1 lakh+ GPUs** and encourage private cloud partnerships.
- Invest in indigenous semiconductor R&D under the **India Semiconductor Mission** with long-term capital support.
- **US CHIPS & Science Act (2022):** $52 billion for domestic chip manufacturing.
- **China's AI & chip mega factories:** subsidised access to compute for startups.

Build a National AI Skilling Grid

- Integrate AI literacy in ITIs, polytechnics, and rural skilling centres.
- Expand **FutureSkills PRIME** and IndiaAI FutureSkills to cover 50,000+ advanced AI researchers by 2030.
- **Singapore SkillsFuture**: Lifelong learning with AI micro-credentials funded for every citizen.
- **EU Digital Skills Agenda**: Sector-wise AI skill frameworks.
- Rangarajan Committee on Employment (2020): invest in **skill diversification & digital competencies** for future jobs.

Improve High-Quality, Trusted, Annotated Datasets

- Expand **AIKosh** datasets to 50,000+ curated datasets with India-specific diversity (languages, agriculture, governance, health).
- **UK's Open Data Initiative**: anonymised datasets for innovation.
- **South Korea AI Hub**: 500+ curated datasets for national AI models.
- Kris Gopalakrishnan AI Task Force (2018): Create a **National Data Marketplace** for AI innovation.

Strengthen Responsible AI & Regulatory Architecture

- Create an **Indian AI Safety & Ethics Commission**.
- Mandate algorithmic audits, bias evaluation, and transparency for high-risk sectors (credit, health, policing).
- **EU AI Act (2023):** risk-based regulatory model.
- **OECD AI Principles:** fairness, accountability, transparency.
- Supreme Court in *Puttaswamy (2017)*: data protection must be foundational; build AI regulation on constitutional privacy principles.

Inclusive AI for MSMEs, Women & Informal Workers

- Offer **AI vouchers**, subsidised cloud credits, and digital training for MSMEs.
- Special AI entrepreneurship funds for **women founders**, especially since they receive <2% VC funding.
- Deploy AI tools (voice-first AI, smart contracts, digital identity) for **490 million informal workers**, as recommended by NITI Aayog's 2025 report.
- **Canada's Women Entrepreneurship Strategy**: gender-responsive funding.
- **Indonesia's MSME digitalisation programme**: sector-based AI adoption.

Accelerate AI Research & Foundational Model Development

- Increase public R&D spending from **<1% of GDP** to at least **2%**, with a focus on AI.
- Expand IndiaAI Foundation Models with 50+ homegrown LLMs for Indian languages.
- **US NSF AI Research Institutes**: academia–industry hubs.
- **Japan's Moonshot AI Research Programme**: long-horizon AI research.

- Kasturirangan Committee (NEP 2020): strengthen research universities supported by national research funding.

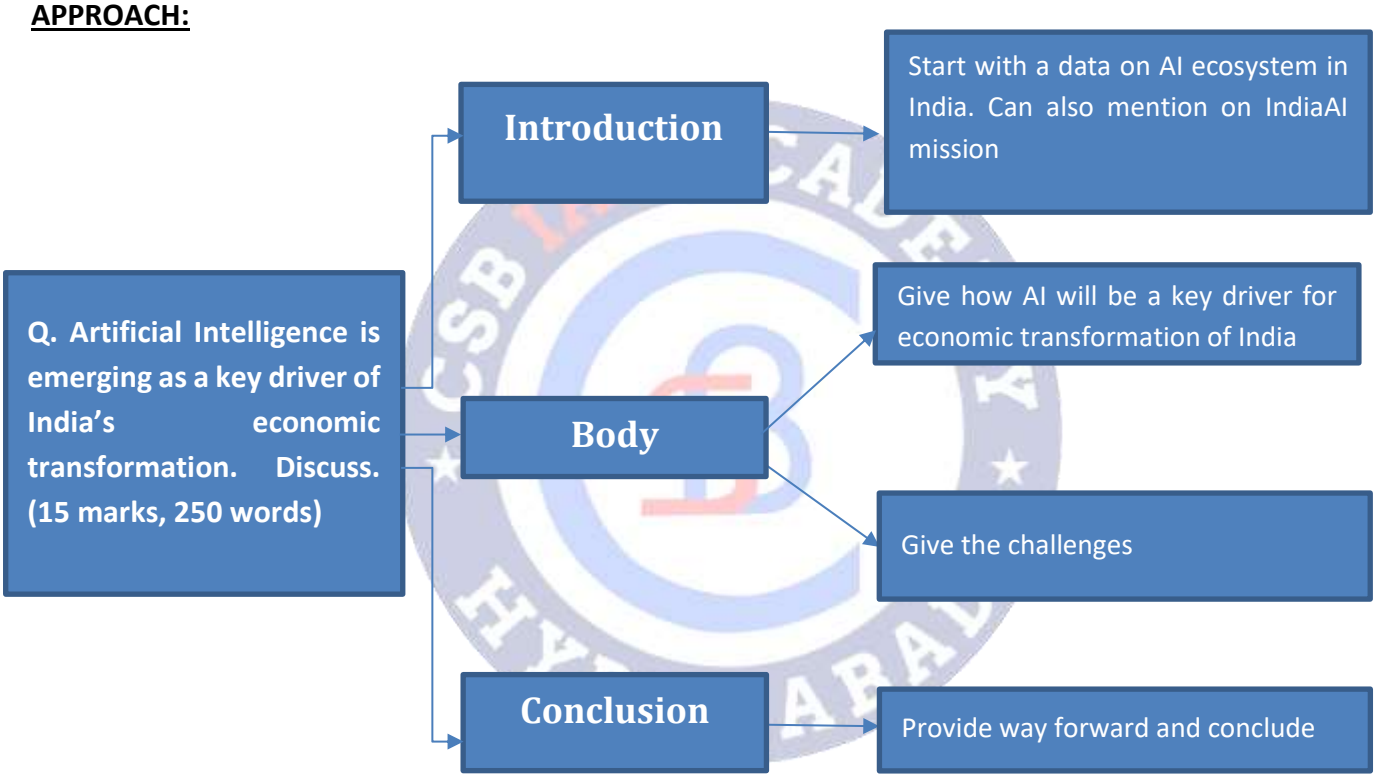
Build AI-Ready Digital Infrastructure for Rural India

- Expand BharatNet for high-speed rural connectivity.
- Deploy Bhashini to all major public-facing platforms railways, banks, agriculture services.
- **Estonia's digital public infrastructure**: universal digital access built around interoperability and open standards.

PRACTICE QUESTION:

Q. Artificial Intelligence is emerging as a key driver of India's economic transformation. Discuss. (15 marks, 250 words)

APPROACH:



MODEL ANSWER:

Artificial Intelligence (AI) has become central to India's economic strategy, with initiatives such as the **IndiaAI Mission**, deployment of **38,000 GPUs**, creation of AI datasets through **AIKosh**, and support to startups and research ecosystems. AI is projected to add **US$ 1.7 trillion to India's economy by 2035**, making it a critical growth engine

AI as a Driver of Economic Transformation

- **Direct Boost to GDP and Employment:** India's tech AI ecosystem employs **6 million people**, and the tech sector is expected to cross **$280 billion in revenue** in 2025. AI alone is projected to add **$1.7 trillion** to GDP by 2035, making it one of the biggest productivity multipliers
- **Sectoral Transformation Across Economy: 87% of Indian enterprises** actively use AI; leading sectors BFSI, industrial manufacturing, healthcare, retail contribute **60% of total AI value**.

- **Innovation and Startup Dynamism:** India hosts **1.8 lakh startups**, with **89%** integrating AI into products/services. IndiaAI Startup Financing and the Global Acceleration Programme expand global market access.
- **Inclusive Growth & Productivity:** AI is enabling digital inclusion via **Bhashini** (20 Indian languages, 350+ models), e-Courts automation, and AI-enabled weather forecasting. NITI Aayog's 2025 roadmap empowers **490 million informal workers** through Digital ShramSetu and voice-first tools

Challenges Hindering AI's Full Potential

- **Compute & Chip Dependency:** Despite 38,000 GPUs, India lags far behind global AI hubs with hundreds of thousands of GPUs. Heavy reliance on imported AI chips and models increases vulnerability to supply chain disruptions
- **Shortage of Advanced AI Talent:** Workforce is **6–6.5 lakh**, projected to reach 12.5 lakh by 2027, still insufficient. Only **26% companies** display AI maturity; Tier-2/3 research ecosystems remain weak
- **Fragmented, Low-Quality Data:** Despite 3,000 datasets on AIKosh, data remains siloed and poorly labelled. Absence of a unified data governance framework creates privacy and accessibility constraints
- **Uneven Adoption Across Sectors:** MSMEs, agriculture and informal workers lag behind elite sectors, risking a widening digital divide. Rural areas still struggle with digital infrastructure despite BharatNet
- **Ethical, Legal, and Regulatory Gaps:** Concerns include algorithmic bias, explainability, job displacement, and privacy. India is yet to finalise a comprehensive AI regulatory architecture

Way Forward

- **Strengthen Compute & Indigenous Chip Manufacturing:** Expand IndiaAI Compute to 1 lakh+ GPUs; leverage India Semiconductor Mission for domestic chip production.
- **Build a National AI Skilling Grid:** Expand FutureSkills PRIME and AI labs to ITIs; adopt Singapore's SkillsFuture-like lifelong AI learning model.
- **Improve Data Governance:** Expand AIKosh to 50,000+ curated datasets; establish a National Data Marketplace (Kris Gopalakrishnan Task Force).
- **Responsible AI Regulation:** Establish an Indian AI Safety & Ethics Commission; adopt EU AI Act–like risk-based regulation.
- **Inclusive AI Ecosystem:** AI vouchers for MSMEs; gender-responsive funds since women-led enterprises receive <2% VC funding.

AI offers India a historic opportunity to accelerate productivity, innovation, and inclusive development. However, for India to become a global AI leader and realise the goals of **Viksit Bharat 2047**, it must address structural bottlenecks compute capacity, talent, data governance, research, and equitable adoption. A calibrated, rights-based, innovation-friendly framework will be essential to harness AI's full transformative power.