Career Launcher IAS

UPSC CURRENT AFFAIRS

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1. Personality Rights in India

- Indian courts, especially the Delhi High Court, are increasingly issuing urgent orders to protect celebrities from unauthorised use of their identity in advertisements, merchandise, scams, and AI-generated content.
- This reflects a judicial response to fast-moving technology and gaps in legislation.

Recent Developments

- Delhi High Court order restrained unauthorised commercial use of actor R Madhavan's name, image, and likeness.

Court ordered:

- Takedown of obscene and AI-generated content
- Ban on sale of merchandise using his persona
- Similar cases filed by Aishwarya Rai Bachchan, Abhishek Bachchan, NTR Jr, and others.
- Courts are now issuing preventive and real-time injunctions, not just post-damage recognition.

What Are Personality Rights?

- Personality rights protect an individual from unauthorised commercial exploitation of:
  - Name
  - Image and likeness
  - Voice
  - Signature
  - Other identifiable personal traits
- They ensure a person retains control over how their identity is used, especially for profit.

Legal Basis of Personality Rights in India

- India has no standalone statute on personality rights. Courts derive them from multiple legal sources:

1. Copyright Act, 1957

- **Section 38A:** Grants performers exclusive rights over commercial use of their performances.
- **Section 38B**: Recognises performers' moral rights:
- **Right to be identified:** Right to object to distortion or modification harming reputation

2. Trademarks Act, 1999

- Celebrities can register names, signatures, catchphrases as trademarks.
- Section 27(2) – Passing Off:
  - Protects goodwill even without registration
  - Prevents false endorsement or association
  - Widely used against fake ads, deepfakes, and impersonation

3. Article 21 of the Constitution

- Personality rights flow from the right to life and personal liberty
- Includes dignity, autonomy, and privacy
- Unauthorised use of identity removes individual control and violates these rights
- Limits and Balancing of Rights
- Personality rights are not automatic or absolute
- Courts require proof of:
  - Reputation
  - Goodwill

Unauthorised commercial use

- Must be balanced against Article 19(1)(a) (freedom of speech):
- Parody, satire, criticism, and journalism are protected
- Courts caution against overbroad enforcement
- Why the Delhi High Court Leads These Cases
- Jurisdiction over national and global digital platforms
- Proximity to central authorities like MeitY and DoT
- Strong expertise in:
  - IP law
  - Digital injunctions
  - John Doe (anonymous) defendants
  - Intermediary liability
- According to experts, dominance reflects institutional expertise, not legislative clarity

Nature of Relief Granted

- Mostly injunctive relief
- Courts direct platforms to:
  - Take down infringing content
  - Block present and future URLs
  - Restrain unlicensed commercial use of identity

Role of IT Rules, 2021

- **Court or government order:** Platforms must act within 36 hours
- **Impersonation or privacy harm:** Content removal within 24 hours
- Other complaints go through grievance redressal with longer timelines
- No transparency mechanism:
  - No compliance logs
  - No review of over-removal

QUESTIONS

1. Consider the following statements regarding Personality Rights in India:

1. Personality rights protect individuals against unauthorised commercial exploitation of their name, image, voice, and likeness.
2. Personality rights in India are explicitly codified under a standalone central legislation.
3. Indian courts derive personality rights primarily from Article 21 of the Constitution.
4. Personality rights are absolute and override freedom of speech under Article 19(1)(a).

Which of the statements given above are correct?

A. 1 and 3 only
B. 1, 2 and 3 only
C. 2 and 4 only
D. 1, 3 and 4 only

2. Consider the following statements:

1. Sections 38A and 38B of the Copyright Act, 1957 recognise performers' economic and moral rights.
2. The Trade Marks Act, 1999 allows celebrities to protect goodwill even without trademark registration.
3. Passing off under Section 27(2) of the Trade Marks Act prevents false endorsement.
4. Personality rights arise exclusively from intellectual property law.

Which of the statements given above are correct?

A. 1, 2 and 3 only
B. 1 and 4 only
C. 2 and 4 only
D. 1, 2, 3 and 4

3. Consider the following statements:

1. Commercial exploitation and false endorsements are protected under freedom of speech.
2. Courts permit parody, satire, and journalistic use of celebrity identity.
3. AI-based voice cloning without consent has been judicially recognised as a violation of personality rights.
4. Personality rights enforcement must satisfy tests of reputation, goodwill, and unauthorised commercial use.

Which of the statements given above are correct?

A. 2, 3 and 4 only
B. 1, 2 and 3 only
C. 1 and 4 only
D. 2 and 4 only

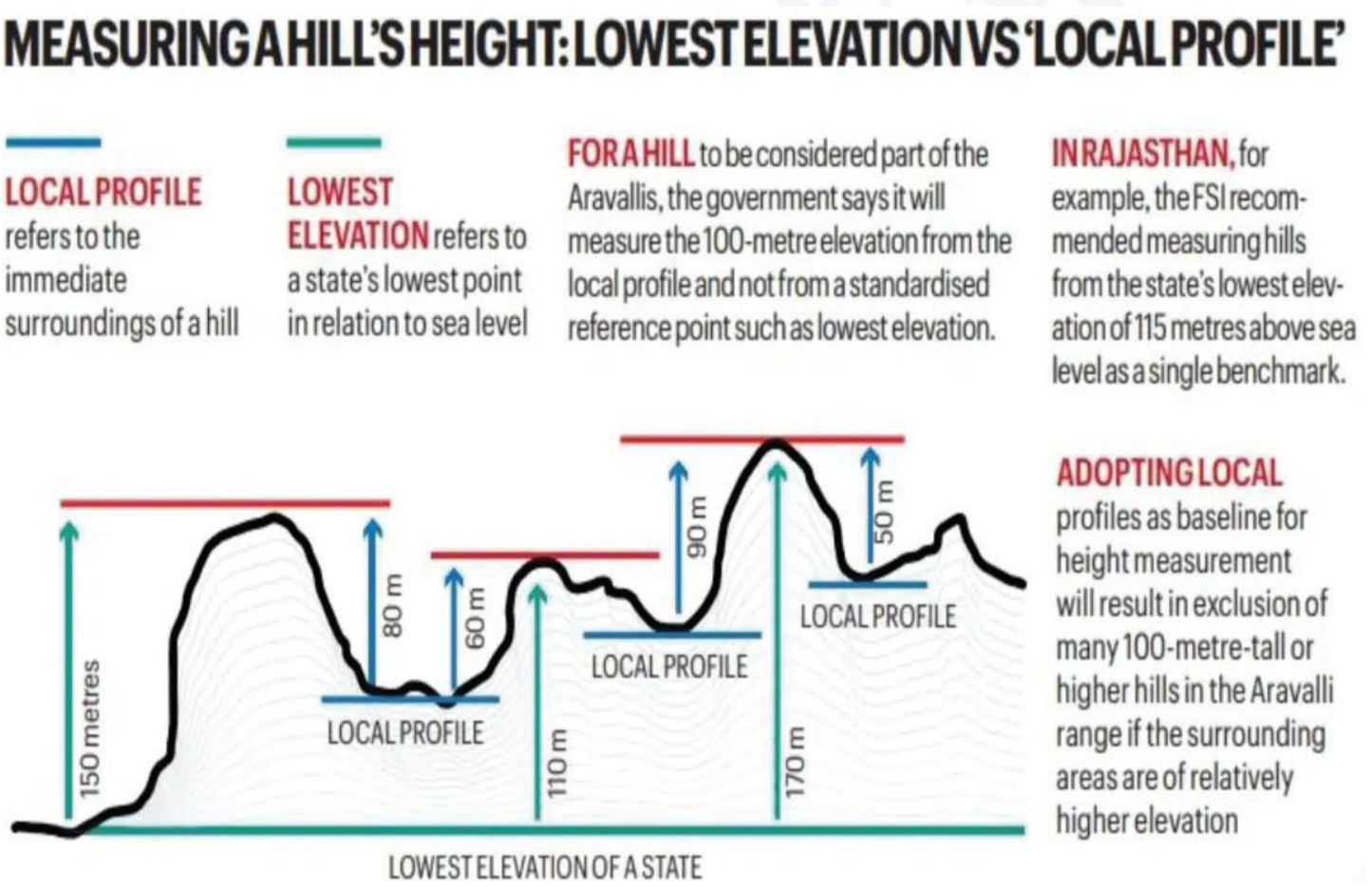
4. 'Right to Privacy' is protected under which Article of the Constitution of India?

A. Article 15
C. Article 21
B. Article 19
D. Article 29

5. Right to Privacy is protected as an intrinsic part of the Right to Life and Personal Liberty. Which of the following in the Constitution of India correctly and appropriately imply the above statement?

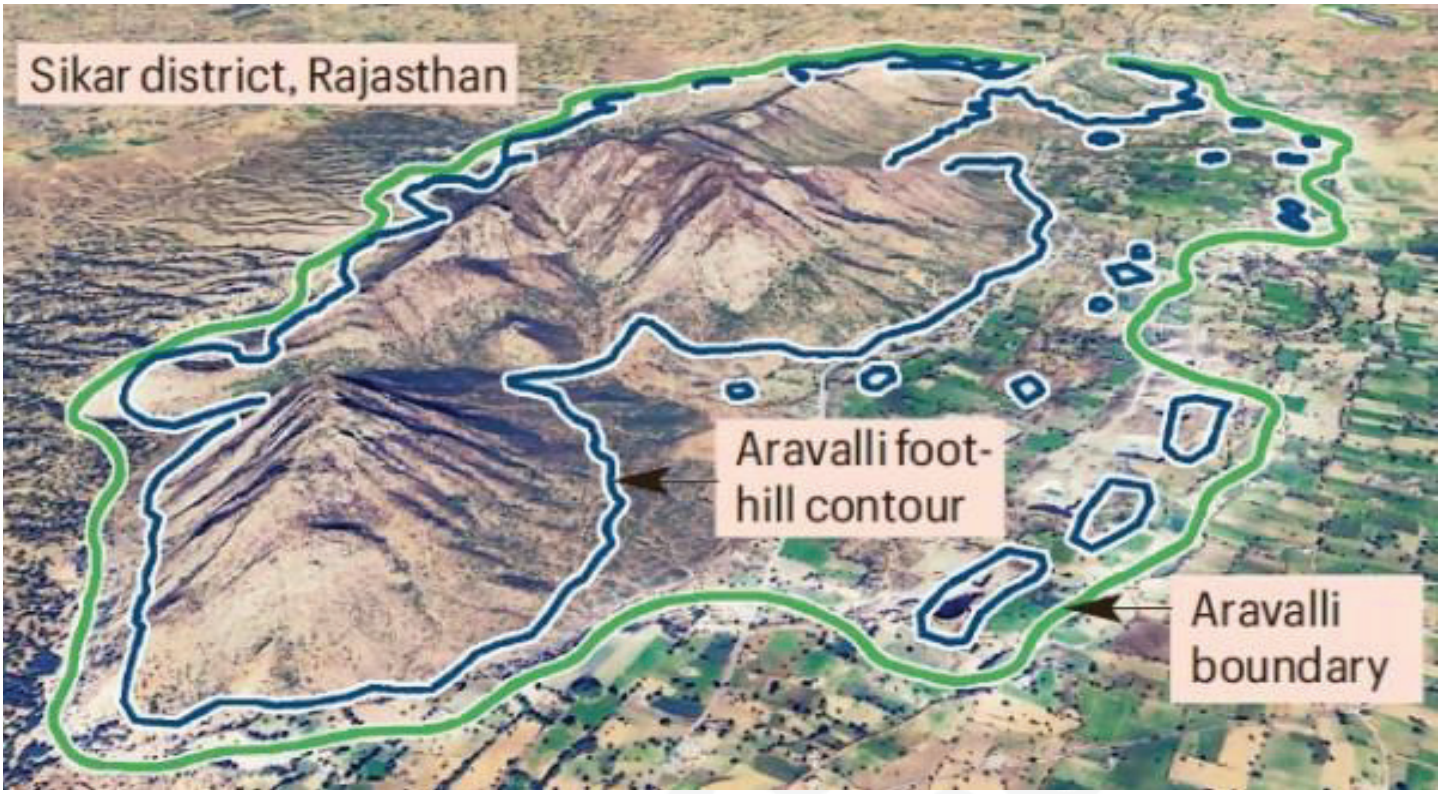
A. Article 14 and the provisions under the 42nd Amendment to the Constitution
B. Article 17 and the Directive Principles of State Policy in Part IV
C. Article 21 and the freedoms guaranteed in Part III
D. Article 24 and the provisions under the 44th Amendment to the Constitution

2. New Aravalli benchmark



- The Union Environment Ministry introduced a new definition of the Aravalli Hills, approved by the Supreme Court.
- This move has triggered protests and criticism from environmental groups and experts.
- The government maintains that there is "no imminent ecological threat" and that the Aravallis remain "robustly protected."

New Definition of Aravalli Hills



Any landform:

- Rising 100 metres or more above the local relief (local surrounding area)
- Includes slopes and adjacent land
- If two such hills are within 500 metres, the land between them is also counted as Aravalli — regardless of elevation.

Government's Key Claims

- Mining will be allowed in only 0.19% of the Aravalli region.
- Total Aravalli expanse cited: 1.44 lakh sq km.
- No new mining leases until a detailed scientific study is completed.
- The Centre claims the new definition covers more area than earlier methods.

What Remains Protected

- Areas protected irrespective of the new definition:
- Tiger reserves (*e.g.*, Sariska, Ranthambhore)
- National parks and wildlife sanctuaries
- Eco-Sensitive Zones (ESZs)
- Wetlands
- Compensatory afforestation plantations
- However:
    - Such protections are not permanent.
    - **Example:** Attempt to "rationalise" Sariska Tiger Reserve boundaries (June 2025) to allow mining — stopped only after Supreme Court intervention.

What Gets Excluded Under the New Definition

- Large parts earlier identified as Aravalli by the Forest Survey of India (FSI) using the 3-degree slope formula.

FSI method:

- Counts all areas above the state's lowest elevation (115 m in Rajasthan) with a minimum 3° slope.
- Rajasthan (≈ two-thirds of Aravalli range) is most affected.

Districts Excluded Despite Known Aravalli Presence

- Sawai Madhopur (Ranthambhore Tiger Reserve)
- Chittorgarh (UNESCO World Heritage Fort)
- Nagaur (1,110 sq km identified as Aravalli by FSI)

Scale of Exclusion

Under FSI method:

- Aravallis cover 40,483 sq km in 15 Rajasthan districts.
- Under the 100-metre local relief definition:
- 99.12% of FSI-identified Aravalli hills would be excluded in these districts.
- Government's 1.44 lakh sq km figure is overstated, as it includes almost the entire area of 34 districts, not just hills.

Centre's Submission to the Supreme Court

Claimed:

- Average slope in 12 of 34 districts is below 3°, so they would be excluded under FSI's method.

Criticism:

- District-level averages include plains, masking actual hilly terrain.
- Measuring height from local profiles instead of a fixed baseline excludes many genuine hills surrounded by high ground.

Environmental Concerns Beyond Mining

- Illegal mining not addressed clearly.
- Future mining possible in newly excluded areas.
- Each mining block affects entire surrounding ecosystems.
- In Delhi NCR, low-height Aravalli extensions may lose recognition, opening land for real estate development.

Aravalli Hills (Aravalli Range)

- The Aravalli Range is one of the oldest mountain ranges in the world.
- It stretches across Gujarat, Rajasthan, Haryana, and Delhi.
- Importance:
- Acts as a natural barrier against desertification
- Supports biodiversity and groundwater recharge
- **Age:** Among the oldest mountain ranges in the world (over 1.5 billion years old)
- **Highest peak:** Guru Shikhar (1,722 m) in the Mount Abu area, Rajasthan

- **Climate role:** Acts as a natural barrier—limits the spread of the Thar Desert eastward and influences rainfall patterns
- **Ecology:** Dry deciduous forests; home to wildlife like leopards, hyenas, deer, and many bird species
- **Human importance:** Rich in minerals; supports agriculture, grazing, and historic settlements
- **Concerns:** Deforestation, mining, and urban expansion have caused significant environmental stress

QUESTIONS

6. Consider the following statements regarding the new definition of the Aravalli Hills approved by the Supreme Court:

1. Under the new definition, any landform rising **100 metres or more above the local relief** is classified as part of the Aravalli Hills, and land between two such hills within 500 metres is also included.
2. The Union Government claims that the new definition allows mining in nearly **one-fifth of the Aravalli region**, significantly expanding mining activity.
3. Areas such as tiger reserves, national parks, wildlife sanctuaries, eco-sensitive zones, and wetlands remain protected irrespective of the new Aravalli definition.
4. According to analyses comparing methods, the new definition would exclude **most areas earlier identified as Aravalli hills by the Forest Survey of India (FSI)** using the 3-degree slope criterion.

Which of the statements given above are correct?

A. Only one
B. Only two
C. Only three
D. All the four

7. Consider the following statements about the Aravalli Range:

1. The Aravalli Range acts as a natural barrier preventing the eastward expansion of the Thar Desert.
2. Guru Shikhar, the highest peak of the Aravalli Range, is located in Gujarat.
3. The Aravalli Range extends across Gujarat, Rajasthan, Haryana, and the National Capital Territory of Delhi.
4. The Aravalli Range is geologically among the youngest mountain ranges in the world.

Which of the statements given above are correct?

A. Only one
B. Only two
C. Only three
D. All the four

8. With reference to environmental concerns related to the new Aravalli definition, consider the following statements:

1. The new definition measures hill height from a fixed sea-level baseline, ensuring uniform identification of hills.
2. District-level average slope calculations may mask the presence of localized hilly terrain.
3. Illegal mining in the Aravalli region has been comprehensively addressed under the new definition.

4. Low-height extensions of the Aravalli Range in the Delhi–NCR region may lose recognition under the new criteria.

Which of the statements given above are correct?

A. Only one
C. Only three
B. Only two
D. All the four

9. Consider the following statements:

1. The Aravalli Range restricts the eastward expansion of the desert.
2. All the rivers of Rajasthan have their origin in the Aravalli Range.
3. The distributional pattern of rainfall in Rajasthan is not affected by the Aravalli Range.
4. The Aravalli region is rich in metallic minerals.

Select the correct answer using the code given below:

A. 1, 2 and 3 are correct
C. Only 3 and 4 are correct
B. 2, 3 and 4 are correct
D. Only 1 and 4 are correct

10. Consider the following statements:

1. The Luni River originates near Pushkar and drains into the Rann of Kutch after flowing westward through the Thar Desert.
2. The Sabarmati River originates in the Aravalli Hills and drains into the Gulf of Khambhat.
3. The Banas River flows westward from the Aravalli Range and drains directly into the Arabian Sea.
4. The Sahibi River flows from the Aravalli Range towards the Yamuna river system.

Which of the statements given above are correct?

A. 1, 2 and 3 only
C. 2 and 3 only
B. 1, 2 and 4 only
D. 1 and 4 only

3. SHANTI Bill

Full name: Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Bill, 2025

- **Passed:** December 18, 2025
- **Replaces:**
  - Atomic Energy Act, 1962
  - Civil Liability for Nuclear Damage Act, 2010
- **Objective:**
  - Enable private sector participation
  - Modernise India's nuclear governance framework
  - Help achieve 100 GW nuclear power capacity by 2047

2. Opening Nuclear Power Sector to Private Players

- Allows public and private companies to:
  - Set up nuclear power plants
  - Operate nuclear facilities
  - Handle transport, storage, import/export of:
    - Nuclear fuel
    - Technology
    - Equipment
    - Nuclear mineral
- **Earlier:** Only public sector entities were permitted
- Foreign Investment
- No explicit FDI provision in the Act
- **Section 3(e) allows participation of:**
  - "Any other person" permitted by the Central Government via notification
- **Government indicates:**
  - FDI norms likely aligned with DPIIT & existing sectoral guidelines

3. Activities Reserved Exclusively for the Central Government

- Still under government monopoly:
- Uranium enrichment & isotopic separation
- Reprocessing of spent fuel
- Management of high-level radioactive waste
- Production and upgradation of heavy water
- **Rationale:** National security & safety concerns

4. Safety & Regulatory Requirements

- Mandatory safety authorisation from AERB for:
  - Setting up & operating nuclear plants
  - Transport, manufacture, possession & disposal of radioactive substances
  - Radiation-generating equipment
  - Decommissioning of nuclear facilities
  - Applies to all entities (public and private)

5. Changes in Nuclear Accident Liability Framework

Removal of Supplier Liability

- Earlier (CLNDA, 2010 – Section 17):
- Operator could seek recourse from suppliers if:
- Defective or sub-standard equipment/services caused accident

Now (SHANTI Bill):

- **Retains:**
  - Contract-based recourse
  - Intentional acts causing damage
  - Removes liability for defective equipment
- **Impact:**
  - Reduces long-term liability risk for suppliers
  - Strongly criticised by Opposition

6. Graded Liability & Insurance Provisions

- Replaces flat liability cap of Rs. 1,500 crore
- Introduces graded liability caps based on:
  - Size and capacity of nuclear installation
- Insurance requirement:
  - Mandatory only for private operators
  - Central government installations exempt
  - Centre empowered to create a Nuclear Liability Fund

7. Penalties & Punishments

- Introduces monetary penalties for minor violations (new provision)
- Retains imprisonment for serious and grave offences
- Earlier laws lacked monetary penalty mechanisms

8. Strengthening Regulatory Autonomy: AERB Reforms

- Grants statutory status to the Atomic Energy Regulatory Board (AERB)
- Addresses long-standing concerns highlighted by CAG (2012):
  - Financial & administrative dependence on DAE
  - Conflict of interest (regulator reporting to regulatee)
- **New framework ensures:**
  - Independent legal authority
  - Separation of regulatory and operational functions

9. New Dispute Resolution & Redressal Mechanisms

- Atomic Energy Redressal Advisory Council
- Handles grievances of licensees
- Facilitates dispute resolution
- Reviews government orders
- Considers complaints referred by AERB
- Nuclear Damage Claims Commission
- Handles cases involving severe nuclear damage
- Appellate Tribunal for Electricity
- **Designated appellate authority for:**
  - Council orders
  - Penalties imposed under the Act

10. Overall Significance

Marks a paradigm shift in India's nuclear energy governance

- **Balances:**
  - Private sector participation
  - Safety oversight
  - Regulatory independence
- **Raises concerns on:**
  - Dilution of supplier accountability
  - Public safety vs investment facilitation

1. Why nuclear energy matters to India

- **Rising energy demand:** India's population and economy are growing fast, so it needs reliable electricity.
- **Low carbon emissions:** Nuclear power produces electricity with very low greenhouse gas emissions, helping fight climate change.
- **Energy security:** Nuclear energy reduces dependence on imported fossil fuels like coal and oil.

2. India's nuclear power program

- India uses nuclear energy only for peaceful purposes like electricity generation.
- Nuclear power plants are operated by NPCIL (Nuclear Power Corporation of India Limited).
- India currently has multiple nuclear reactors producing electricity, contributing a small but important share of total power.

3. Three-stage nuclear program (unique to India)

- India follows a long-term plan developed by Dr. Homi Bhabha:
  - **Stage 1:** Uses natural uranium in reactors
  - **Stage 2:** Uses plutonium produced in Stage 1
  - **Stage 3:** Uses thorium (India has large thorium reserves)
- This is important because India has limited uranium but abundant thorium.

4. Major nuclear power plants in India

- Some well-known ones:
  - Tarapur (Maharashtra)
  - Kudankulam (Tamil Nadu)
  - Kalpakkam (Tamil Nadu)
  - Rajasthan Atomic Power Station
  - Kakrapar (Gujarat)

5. Safety and regulation

- Nuclear plants in India are regulated by the Atomic Energy Regulatory Board (AERB).
- Safety systems are designed to prevent accidents and limit radiation exposure.
- International safety standards are followed.

6. Advantages and concerns

Advantages

- Clean energy
- Reliable base-load power
- Uses India's scientific expertise

Concerns

- High cost of construction
- Nuclear waste management
- Public concerns about safety

7. India and the world

- India cooperates with countries like Russia, France, and the USA for nuclear technology.
- It supports peaceful use of nuclear energy and global nuclear safety.

QUESTIONS

11. Consider the following statements regarding the **Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Bill, 2025**:

1. The SHANTI Bill, 2025 replaces both the Atomic Energy Act, 1962 and the Civil Liability for Nuclear Damage Act, 2010.
2. The Bill seeks to achieve a target of 100 GW of nuclear power capacity in India by 2030.
3. The Bill allows private sector participation in setting up and operating nuclear power plants in India.

Which of the statements given above are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

12. Consider the following statements about **activities under the SHANTI Bill, 2025**:

1. Uranium enrichment and isotopic separation remain exclusively under the control of the Central Government.
2. Private companies are allowed to reprocess spent nuclear fuel under government supervision.
3. Management of high-level radioactive waste continues to remain a government monopoly.

Which of the statements given above are correct?

A. 1 and 2 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

13. Consider the following statements regarding **nuclear liability and regulation under the SHANTI Bill, 2025**:

1. The Bill removes supplier liability for defective equipment in nuclear accidents.
2. Mandatory nuclear insurance applies to both government and private nuclear installations.
3. The Atomic Energy Regulatory Board (AERB) is granted statutory status to enhance regulatory independence.

Which of the statements given above are correct?

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

14. In India, why are some nuclear reactors kept under **International Atomic Energy Agency (IAEA) safeguards** while others are not? **(UPSC Prelims 2020)**

A. Some use uranium and others use thorium
B. Some use imported uranium and others use domestic supplies
C. Some are operated by foreign enterprises and others are operated by domestic enterprises
D. Some are State-owned and others are privately owned

15. In the Indian context, what is the implication of ratifying the **'Additional Protocol'** with the **International Atomic Energy Agency (IAEA)**? **(UPSC Prelims 2018)**

A. The civilian nuclear reactors come under IAEA safeguards.
B. The military nuclear installations come under the inspection of IAEA.
C. The country will have the privilege to buy uranium from the Nuclear Suppliers Group (NSG).
D. The country automatically becomes a member of the NSG.

16. India's **three-stage nuclear power programme** is primarily designed to:

A. Reduce dependence on coal-based power generation
B. Use imported uranium efficiently
C. Exploit India's abundant thorium reserves
D. Shift completely to renewable energy

17. In India, **nuclear power plants producing electricity** are operated and regulated respectively by:

A. Department of Atomic Energy and Ministry of Power
B. NPCIL and Atomic Energy Regulatory Board
C. NTPC and Central Electricity Authority
D. ISRO and Nuclear Power Corporation of India Limited

4. Google's Project Suncatcher

1. What Is Project Suncatcher?

- A long-term research initiative by Google to build solar-powered data centres in space
- Aims to begin deployment by 2027
- Focuses on scaling machine learning computation beyond Earth

2. Key Technologies Involved

- Solar-powered satellite constellations
- Tensor Processing Units (TPUs)
- Google's custom chips optimized for high-volume, low-precision AI computation
- Laser-based optical links
- Enable high-speed data transfer between satellites
- Designed to replicate data centre-level interconnections in space
- Chips have been tested for radiation tolerance and harsh space conditions

3. Planned Missions

- Two prototype satellites to be launched by early 2027
- Partnership with Planet Labs, an Earth-imaging company
- **Mission goal:** learning and validation, not immediate commercial use

4. Why Build Data Centres in Space?

Environmental Reasons

- **Terrestrial data centres:**
  - Consume vast amounts of electricity and water
  - Rely heavily on fossil fuels
- **Goldman Sachs estimate:**
  - 165% increase in data centre electricity demand by 2030
- **Space-based centres could:**
  - Use continuous solar energy
  - Reduce Earth's environmental burden
  - Operational Reliability
- **Earth-based risks:**
  - Undersea cable cuts
  - Natural disasters (earthquakes, hurricanes)

- **Space advantages:**
  - Predictable climate
  - Constant solar radiation, especially on the Moon

5. Data Sovereignty and Legal Advantages

- National laws restrict where data can be stored and processed
- **Outer Space Treaty (1967):**
  - Prohibits national sovereignty claims over space and the Moon
- **Potential benefit:**
  - A single lunar data centre could legally host global clients
  - Avoids national data localisation barriers

6. Falling Costs Make It Feasible

- Major advances in rocket and launch technologies
- **Reduced costs for:**
  - Experimental payloads
  - Satellite deployment
- Makes space-based data centres economically plausible for testing

7. Challenges and Limitations

- Extremely high setup and maintenance costs
- Repairs are difficult and may require on-site human expertise
- **Latency issues:**
  - Moon–Earth distance causes delays
  - Real-time computation remains challenging
- Cybersecurity risks in space environments remain unresolved

8. How Other Companies Are Approaching Space Data Centres

- **OpenAI (Sam Altman):**
  - Proposed Dyson sphere–like AI infrastructure
  - Part of the $500 billion Stargate project
- **Nvidia:**
  - Launched the Starcloud satellite with an H100 GPU
  - Claims massive AI performance gains
- **Lonestar Data Holdings:**
  - Sent a 1-kg mini data centre with 8 TB SSD storage to the Moon
- **Amazon / Blue Origin (Jeff Bezos):**
  - Intends to move polluting industries, including data centres, off Earth
- **Eric Schmidt (former Google CEO):**
  - Confirmed plans to place data centres in orbit

18. Consider the following statements regarding **Google's Project Suncatcher**:

1. Project Suncatcher aims to deploy solar-powered data centres in space to scale AI computation beyond Earth.
2. The project is intended for immediate commercial cloud services beginning in 2027.
3. Tensor Processing Units (TPUs) form a core computing component of the project.

Which of the statements given above is/are correct?

A. 1 and 3 only
B. 1 only
C. 2 and 3 only
D. 1, 2 and 3

19. With reference to **space-based data centres**, consider the following statements:

1. Space-based data centres can reduce dependence on fossil fuels by using continuous solar energy.
2. The Outer Space Treaty allows countries to claim sovereign control over lunar data centres.
3. Latency remains a major challenge for Moon-based computation.

Which of the statements given above is/are correct?

A. 1 only
B. 1 and 3 only
C. 2 and 3 only
D. 1, 2 and 3

20. Consider the following statements regarding **global initiatives on space-based data centres**:

1. Nvidia has already launched a satellite equipped with an H100 GPU.
2. Lonestar Data Holdings has successfully sent a mini data centre to the Moon.
3. All such initiatives are currently operational at commercial scale.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 only
D. 1, 2 and 3

5. India and New Zealand Free Trade Agreement

- India and New Zealand finalized a Free Trade Agreement on 22 December 2025, with formal signing and implementation expected in 2026 after domestic approvals.
- The deal aims to significantly expand trade and economic cooperation between the nations, with both sides targeting a doubling of bilateral trade over the next five years.
- India-New Zealand FTA is a historic milestone as it is India's first women-led FTA. Almost the entire negotiating team comprised women.

1. Tariff Elimination & Market Access

- New Zealand will remove tariffs on 100% of Indian exports, offering zero duties on all Indian goods entering its market once the FTA is in force.
- India will eliminate or cut tariffs on ~70% of tariff lines covering ~95% of New Zealand's exports by value, one of the highest market access levels New Zealand has received in any Indian FTA.
- Sensitive Indian products (*e.g.*, dairy, sugar, edible oils) have been protected from tariff cuts to avoid undermining domestic producers.

2. Services, Mobility, and Visas

- The agreement includes ambitious measures on services and people mobility:
- Expanded market access in hundreds of services sectors such as IT, financial services, education, tourism, and construction.
- Provisions for work and study visas, including thousands of temporary work visas and extended post-study work rights for Indian students (*e.g.*, up to 3–4 years for STEM and doctoral graduates).

3. Investment and Collaboration

- New Zealand has committed to facilitating up to $20 billion in investment into India over 15 years, helping boost infrastructure, industry, and technology linkages.

4. Agricultural & Technical Cooperation

- While tariff cuts on some agricultural imports are limited, the pact includes productivity partnerships like Centres of Excellence in fruit and horticulture, which can transfer technology and best practices.

What Makes This FTA Unique

1. Strong Market Access for India

- New Zealand's commitment to zero duties on 100% of Indian exports is rare in India's FTAs, especially with developed economies, and benefits labour-intensive sectors like textiles, footwear, leather and engineering goods.

2. Extensive Services & Mobility Provisions

- Unlike many traditional FTAs that focus primarily on goods, this agreement puts services trade and mobility at the forefront — covering over a hundred services sectors and facilitating easier movement of students and professionals.

3. High Level of Investment Commitment

- A substantial $20 billion investment pledge over 15 years, backed by mechanisms to ensure delivery, stands out among India's recent trade agreements.

4. Speed and Cooperation

- Negotiated in just about nine months and described as one of India's fastest FTAs with a developed country, the deal showcases strong political will on both sides.

5. Inclusive and Strategic Focus

- The pact emphasises inclusive growth — protecting sensitive sectors, supporting MSMEs and farmers, and even being highlighted for significant inclusion of women negotiators (reported by some outlets as the first "women-led" FTA in India's trade history).

Why It Matters

For India

- Boosts exports into New Zealand's market with zero tariffs.
- Raises competitiveness for sectors like textiles, pharmaceuticals, engineering, and services.
- Provides new work/study pathways for Indian youth.
- Attracts foreign investment and strengthens integration into global value chains.

For New Zealand

- Opens access to 1.4 billion consumers in India's fast-growing market.
- Secures high-value markets for horticulture, wood, wool and meat with reduced tariffs.
- Expands services and professional opportunities for New Zealand businesses.

1. What is a Free Trade Agreement (FTA)?

- A Free Trade Agreement is a treaty between two or more countries to reduce or eliminate barriers to trade—like tariffs, import quotas, and duties—on goods and services traded between them. The goal is to make trading easier and cheaper.
- FTAs can also cover other areas like investment, intellectual property, and government procurement.

2. India's Approach to FTAs

India has been actively pursuing FTAs to:

- Expand exports
- Access cheaper imports
- Strengthen strategic and economic ties with partner countries

Compete in global trade

- India has signed bilateral, regional, and multilateral trade agreements.
- However, India is often cautious because it wants to protect domestic industries, like agriculture, textiles, and manufacturing, from foreign competition.

3. Key FTAs and Trade Agreements of India

A. Bilateral FTAs

India–Japan CEPA (Comprehensive Economic Partnership Agreement) – 2011

- Focuses on goods, services, and investment.

India–South Korea CEPA – 2010

- Covers trade in goods, services, and investment protection.

India–ASEAN FTA – 2009

- India has a free trade agreement with the ASEAN countries (like Thailand, Singapore, Malaysia) for goods and services.

B. Regional/Multilateral FTAs

South Asian Free Trade Area (SAFTA) – 2006

- Includes countries like Pakistan, Sri Lanka, Bangladesh, Nepal, Bhutan, Maldives, and Afghanistan. It promotes trade within South Asia.

India–Mercosur PTA (Preferential Trade Agreement) – 2009

- Trade agreement with Brazil, Argentina, Uruguay, and Paraguay. India exports cars, sugar, and chemicals to Mercosur countries.

4. Challenges for India

- **Trade deficits:** India often imports more than it exports in FTAs (*e.g.*, with ASEAN, South Korea).
- **Domestic industry protection:** Some sectors fear competition from cheaper imports.
- **Slow negotiations:** India sometimes delays agreements to protect sensitive sectors.

5. Recent Developments

- India is negotiating FTAs with countries like the European Union, UK, and Canada.
- India is also part of regional trade agreements like the RCEP (Regional Comprehensive Economic Partnership) but opted out in 2019 due to concerns over imports from China.

QUESTIONS

21. Consider the following statements regarding the **India–New Zealand Free Trade Agreement (FTA)**:

1. New Zealand has agreed to eliminate tariffs on 100% of Indian exports once the agreement enters into force.
2. India will remove tariffs on all agricultural products imported from New Zealand under this agreement.
3. The agreement aims to double bilateral trade between India and New Zealand within five years.

Which of the statements given above is/are correct?

A. 1 and 3 only

B. 1 only

C. 2 and 3 only

D. 1, 2 and 3

22. With reference to the **services and mobility provisions** of the India–New Zealand FTA, consider the following statements:

1. The agreement expands market access across a wide range of service sectors including IT, education, tourism, and financial services.
2. It provides extended post-study work rights for Indian students, especially in STEM and doctoral fields.
3. The agreement restricts labour mobility to short-term business visitors only.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3

23. Consider the following statements about the **distinctive features** of the India–New Zealand FTA:

1. It is regarded as India's first "women-led" Free Trade Agreement.
2. It includes a long-term investment facilitation commitment of up to $20 billion into India.
3. It was negotiated over more than a decade due to sensitivity in agricultural sectors.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3

24. With reference to **India's Free Trade Agreements (FTAs)**, consider the following statements:

1. India generally adopts a cautious approach to FTAs to protect sensitive domestic sectors like agriculture and manufacturing.
2. The India–ASEAN FTA covers trade in both goods and services.
3. The India–Mercosur agreement is a Comprehensive Economic Partnership Agreement (CEPA).

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3

25. Consider the following countries:

1. South Korea
2. Japan
3. Australia
4. UK
5. UAE
6. USA

With how many of the above countries does India have Free Trade Agreements (FTAs)?

A. Only three
B. Only four
C. Only five
D. All Six countries

6. 2000 MW Subansiri Lower Hydroelectric Project

- Shri Manohar Lal, Union Minister of Power, Housing & Urban Affairs, inaugurated Unit-2 (250 MW) of the 2000 MW Subansiri Lower Hydroelectric Project via virtual mode.
- Described as a symbol of India's commitment to clean and sustainable energy.
- The project supports North-East India's growth, strengthens the national grid, and contributes to India's Net Zero goals.

Project Details

- **Total Capacity:** 2000 MW (8×250 MW units).
- **Type:** Run-of-the-River scheme with small pondage.
- **Annual Generation**: 7,422 million units (MU) of renewable electricity.
- **Dam Features:** 116-meter-high concrete gravity dam, largest in North-East India, aids in flood moderation and water management.
- Engineering Achievements:
- Heaviest hydro generator rotors and largest stators in India.
- Largest main inlet valves.
- Innovations: highest-capacity batching plant, first use of Rotec's Tower Belt in India.
- **Flood cushion:** 442 million cubic meters; one-third reservoir storage kept empty for floods.

Phased Commissioning

- Unit-2 operational; 3 additional units of 250 MW each to be commissioned shortly.
- Remaining four units to be commissioned during 2026-27.
- Full commissioning will significantly enhance renewable energy capacity and grid resilience.

Regional & National Benefits

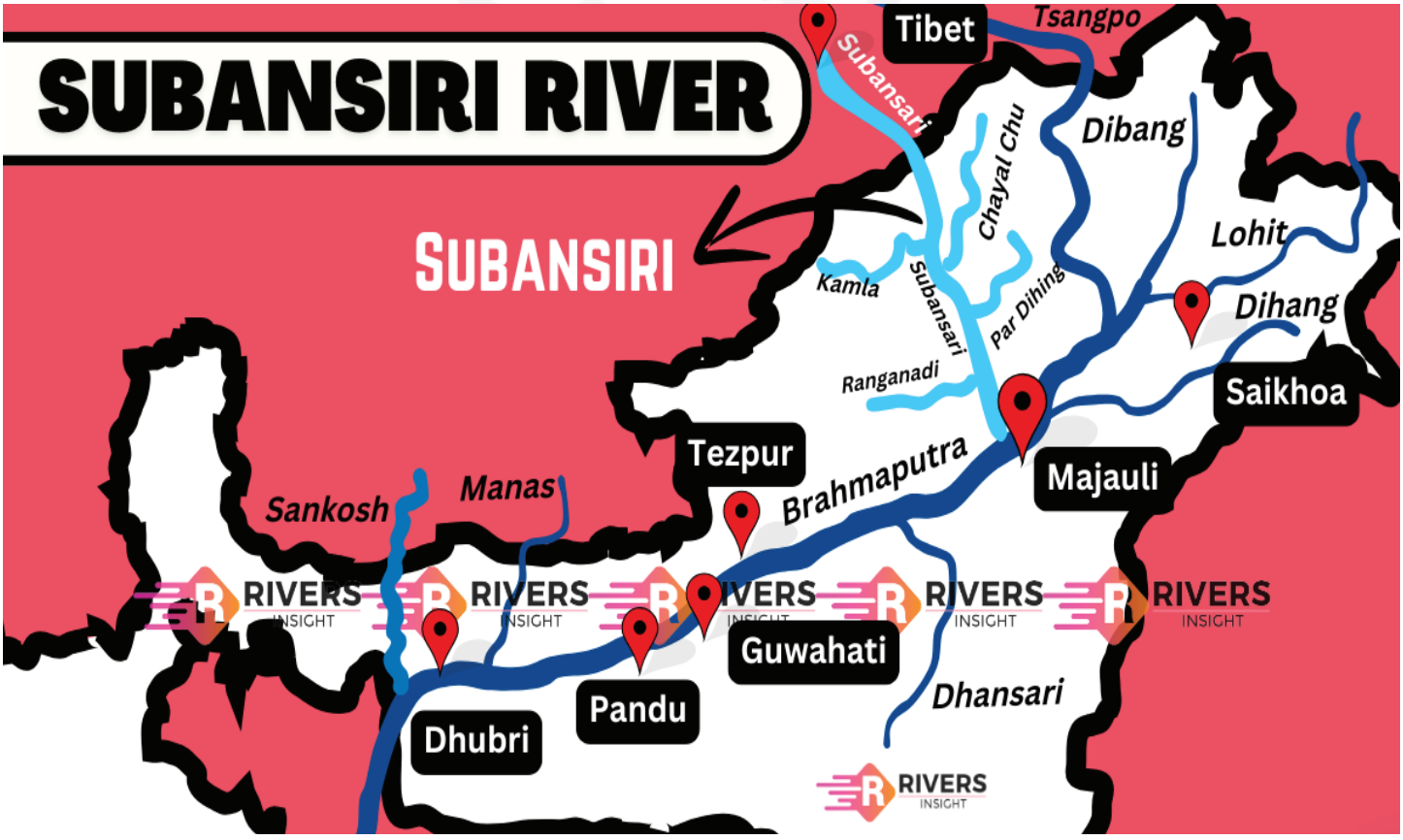
- Electricity supplied to 16 beneficiary states.
- Free power allocations: Arunachal Pradesh and Assam.
- **North-East region:** 1,000 MW from the project.
- Supports new small-scale industries, boosts tourism, and enhances river navigation.

Socio-Economic & Community Impact

- **Employment:** Engaged ~7,000 local people daily during construction.
- **Livelihood programs:** Piggery, sericulture, handloom; benefit ~5,000 women farmers.
- **CSR Investment:** Rs. 155 crore in Arunachal Pradesh & Assam. Key initiatives:
- 3,129 toilets under Swachh Vidyalaya Abhiyaan.
- Vivekananda Kendra Vidyalaya (250 students).
- Safe drinking water and RO facilities at 1,841 and 9 locations, respectively.
- Rural development projects: community halls, causeways, water supply schemes.

Environmental & Safety Measures

- Riverbank protection and erosion control: 30 km completed, 60 km planned; investment ~Rs. 522 crore.
- Enhances flood control, riverbank stabilization, and regional infrastructure resilience.



NHPC's Achievements & Vision

- Over 50 years of hydropower development in challenging terrains.
- Diversified into solar, wind, and green hydrogen; 100% Green Energy Company.
- **Installed capacity:** 8,333 MW from 30 stations.
- **Under construction:** 14 projects totaling 9,704 MW.
- Plays a crucial role in India's clean energy transition and national energy security.

Subansiri River

- The Subansiri River is a major river in the northeastern part of India and is a significant tributary of the Brahmaputra River.

Geography

- **Origin:** It originates in the Himalayan region of Tibet, where it is called the Chayul Chu.
- **Course:** It flows through Arunachal Pradesh and then enters Assam before joining the Brahmaputra River.
- **Length:** Approximately 518 km in India.

Significance

- **Hydroelectric Potential:** The Subansiri has a high flow and steep gradient, making it ideal for hydroelectric projects.
- The Lower Subansiri Hydro Electric Project (LSHEP) is one of the largest in India.
- **Tributaries:** It has several tributaries, including the Kimi, Nye, Dikrong, and Tsari Chu rivers.
- **Ecological Importance:** The river supports rich biodiversity and is crucial for agriculture and fishing in Assam.

QUESTIONS

26. Consider the following statements regarding the **Subansiri Lower Hydroelectric Project (SLHEP)**:

1. It is a run-of-the-river hydroelectric project with small pondage.
2. The project consists of eight units of 250 MW each.
3. It is designed primarily as a pumped-storage hydroelectric scheme.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 2 only
C. 1 and 3 only
D. 1, 2 and 3

27. With reference to the **engineering and safety features** of the Subansiri Lower Hydroelectric Project, consider the following statements:

1. The project has a 116-metre-high concrete gravity dam, the tallest of its kind in North-East India.
2. One-third of the reservoir storage is kept empty as flood cushion for flood moderation.
3. The project uses the largest hydro generator rotors and stators installed in India.

Which of the statements given above is/are correct?

A. 1 only
B. 1 and 2 only
C. 1, 2 and 3
D. 2 and 3 only

28. Consider the following statements regarding the **Subansiri River**:

1. It originates in the Himalayan region of Tibet, where it is known as the Chayul Chu.
2. It is a tributary of the Ganga River system.
3. It flows through Arunachal Pradesh and Assam before joining the Brahmaputra.

Which of the statements given above is/are correct?

A. 1 and 3 only
B. 1 and 2 only
C. 2 and 3 only
D. 1, 2 and 3

29. Which of the following is/are tributary/tributaries of the **Brahmaputra River**?

1. Dibang
2. Kameng
3. Lohit

Select the correct answer using the code given below:

A. 1 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

30. Which of the following is/are Right bank tributary/tributaries of the Brahmaputra River**?**

1. Subansiri
2. Sankosh
3. Teesta
4. Lohit
5. Dhansiri

Select the correct answer using codes given below:

A. 1 only
B. 1, 2 and 3 only
C. 1, 4 and 5 only
D. All of the above

7. ISRO's heaviest-ever launch, LVM3-M6 mission

- ISRO launched the LVM-3 rocket carrying BlueBird Block-2, its heaviest-ever satellite at nearly 6,100 kg.
- The satellite will be placed into a low Earth orbit (LEO) of ~520 km about 15 minutes after liftoff.

About BlueBird Block-2

- Designed by AST SpaceMobile (USA).
- Will be the largest commercial communications satellite in LEO.
- Part of a constellation enabling direct-to-mobile connectivity, allowing ordinary smartphones to connect without ground relay stations.
- Supports 4G and 5G voice calls, video calls, messaging, streaming, and data, aimed at global coverage.

Why the mission matters

- This is ISRO's third commercial mission using LVM-3, after two OneWeb launches in 2022 and 2023.
- India emerged as a key launch partner after Russia halted services due to the Ukraine war and ESA's Ariane-5 was retired.
- Demonstrates ISRO's ability to conduct heavy-lift commercial launches at competitive costs, competing with SpaceX's Falcon-9 and ESA's Ariane 6.

LVM-3's growing role

- Originally designed for geosynchronous missions (~36,000 km altitude), the rocket has been adapted for LEO deployments.
- This is the third LEO mission using
- LVM-3.
- The rocket was earlier known as
- GSLV-Mk3 before being renamed.

Operational milestone

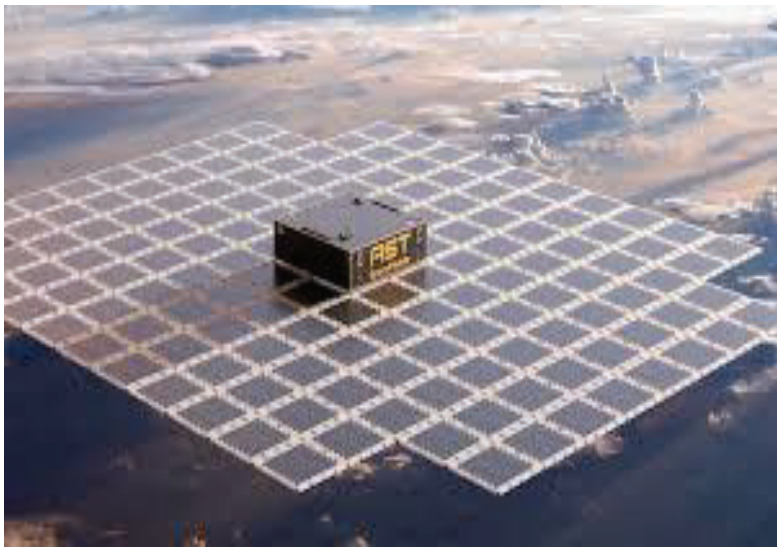
- Comes just weeks after the CMS-03 communication satellite launch on November 2, marking the shortest gap between two LVM-3 launches.
- Second year (after 2023) in which ISRO conducts two LVM-3 launches in a single year, reflecting improved launch readiness.

Record-breaking payload

- BlueBird Block-2 (6,100 kg) is the heaviest single payload ISRO has placed into orbit.
- **Previous record:** OneWeb satellite batches (~5,700 kg) to LEO.
- ISRO also set a record recently for heaviest satellite to GTO with CMS-03 (4,410 kg).

Upgrades for future missions

- LVM-3 is being enhanced for human spaceflight (Gaganyaan) and to support the Bharatiya Antariksh Station.



Cryogenic upper stage upgrade:

- **Current C25 stage:** 28,000 kg propellant, 20-tonne thrust.
- **New C32 stage:** 32,000 kg propellant, 22-tonne thrust.

Semi-cryogenic engine development:

- Will replace the liquid second stage with refined kerosene + liquid oxygen.
- Increases LEO payload capacity from 8,000 kg to ~10,000 kg.
- Reduces costs and improves performance.

Advanced engine efficiency

- ISRO is developing bootstrap reignition for cryogenic engines.
- Allows autonomous restart of the upper stage without external gases like helium.
- Reduces fuel mass and boosts payload capacity, especially useful for multi-orbit LEO missions.

Overall significance:

- The BlueBird Block-2 launch showcases ISRO's maturing heavy-lift capability, rising stature in the global commercial launch market, and steady progress toward human spaceflight and an indigenous space station.

QUESTIONS

31. Consider the following statements regarding **ISRO's LVM3-M6 mission**:

1. BlueBird Block-2 is the heaviest single payload ever placed into orbit by ISRO.
2. The satellite has been designed to operate in Geosynchronous Transfer Orbit (GTO).
3. LVM-3 was earlier known as GSLV-Mk III.

Which of the statements given above are correct?

A. 1 and 2 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2 and 3

32. Consider the following statements about **BlueBird Block-2 satellite**:

1. It is designed by AST SpaceMobile of the United States.
2. It enables direct-to-mobile connectivity without requiring ground relay stations.
3. It supports only satellite-based messaging and not voice or data services.

Which of the statements given above are correct?

A. 1 and 2 only
C. 1 only
B. 2 and 3 only
D. 1, 2 and 3

33. With reference to **LVM-3 launch vehicle and its future upgrades**, consider the following statements:

1. LVM-3 has been adapted to deploy satellites into Low Earth Orbit in addition to geosynchronous missions.
2. The proposed semi-cryogenic engine will increase LEO payload capacity to about 10,000 kg.
3. Bootstrap reignition technology reduces dependence on external gases like helium for engine restart.

Which of the statements given above are correct?

A. 1 only
C. 1, 2 and 3
B. 1 and 2 only
D. 2 and 3 only

34. With reference to India's satellite launch vehicles, consider the following statements:

1. **PSLVs** launch satellites useful for Earth resources monitoring, whereas **GSLVs** are designed mainly to launch communication satellites.

2. Satellites launched by **PSLV** appear to remain permanently fixed in the same position in the sky, as viewed from a particular location on Earth.
3. **GSLV Mk III** is a four-staged launch vehicle with the first and third stages using solid rocket motors, and the second and fourth stages using liquid rocket engines.

Which of the statements given above is/are correct?

A. 1 only
C. 1 and 2
B. 2 and 3
D. 3 only

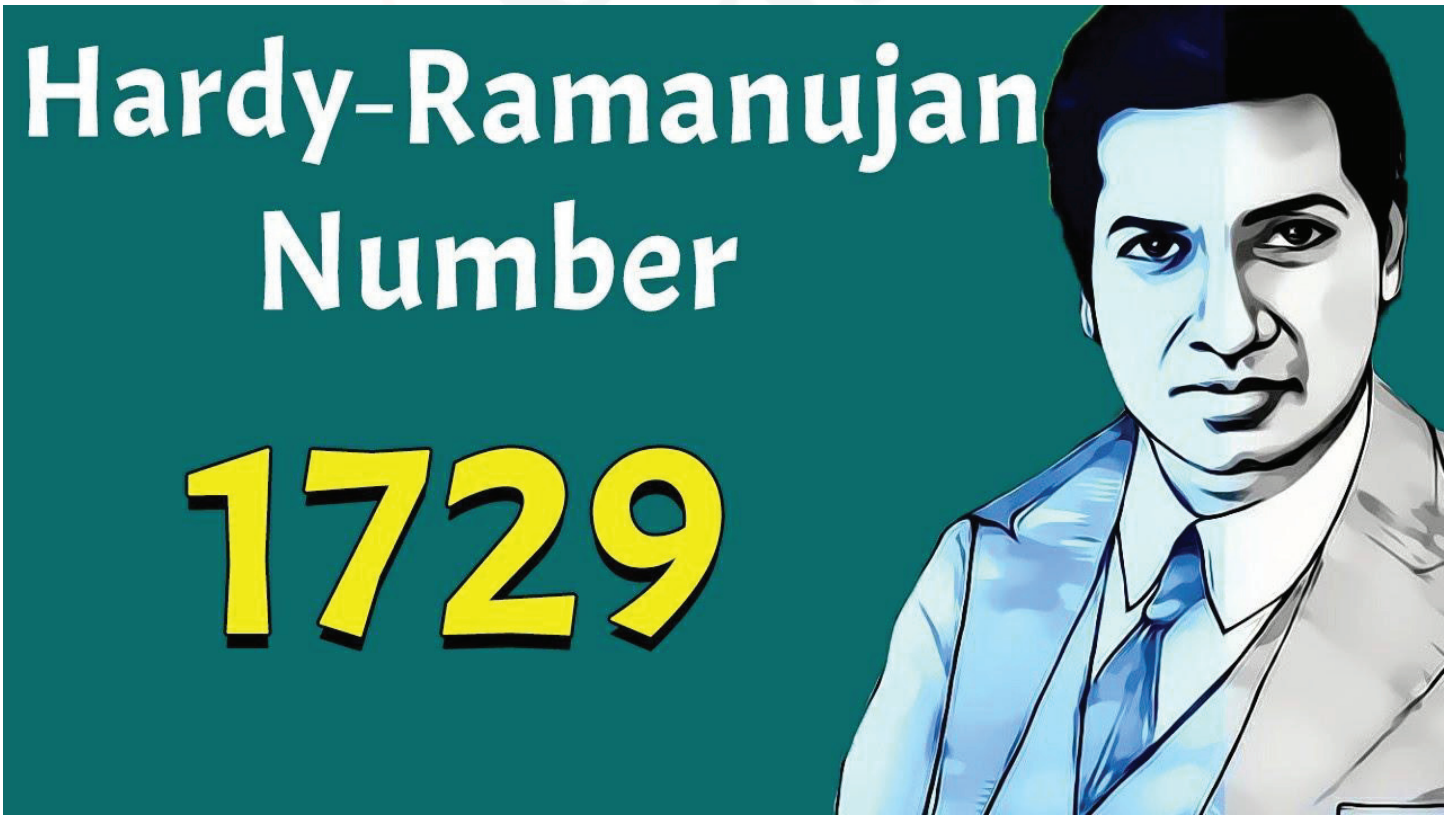
35. Which of the following statements about the **Polar Satellite Launch Vehicle (PSLV)** is **not correct**?

1. PSLV is a third-generation launch vehicle of India.
2. PSLV is the first Indian launch vehicle to be equipped with liquid stages.
3. PSLV has also been used to launch various satellites into Geosynchronous and Geostationary orbits.
4. It can take up to 7,000 kg of payload to Sun-Synchronous Polar Orbits of 600 km altitude.
5. It can take up to 1,750 kg of payload to Sun-Synchronous Polar Orbits of 600 km altitude.

How many of the above statements are **correct**?

A. Two statements only
C. Four statements only
B. Three statements only
D. All statements

8. Hardy–Ramanujan number



National Mathematics Day & Srinivasa Ramanujan

- December 22 is celebrated as National Mathematics Day in India
- It marks the birth anniversary of Srinivasa Ramanujan (1887–1920), one of history's greatest mathematicians
- While often portrayed as a mysterious genius, Ramanujan's work was deeply rooted in intense study, pattern recognition, and mathematical rigor

Who Was Srinivasa Ramanujan?

- Born in 1887 in Kumbakonam, Tamil Nadu, to a Tamil Brahmin Iyengar family
- Largely self-taught in mathematics
- Deeply religious; his family worshipped the goddess Namagiri
- Wrote to British mathematician G. H. Hardy in 1913, who immediately recognised his genius
- Moved to England (1914) to work at Cambridge University

Became:

- One of the youngest Fellows of the Royal Society
- The first Indian Fellow of Trinity College, Cambridge
- Died at the age of 32 due to ill health
- Ramanujan's Unconventional Mathematical Style
- Known for writing down correct formulas without formal proofs
- His approach seemed intuitive and mystical, leading to legends (*e.g.*, ideas revealed in dreams by goddess Namagiri)

However, modern scholarship shows:

- His insights came from deep engagement with number theory
- He explored patterns, identities, and exceptions ("near misses") extensively

The Hardy–Ramanujan Number (1729)

- **729** is the **smallest number** expressible as the sum of two cubes in **two different ways**:
  - 13+123=17291^3 + 12^3 = 172913+123=1729
  - 93+103=17299^3 + 10^3 = 172993+103=1729

The Famous Anecdote

- During Ramanujan's hospital stay in Putney, England
- G. H. Hardy mentioned his taxi number 1729 as "dull"
- Ramanujan instantly replied that it was very interesting
- Demonstrated his extraordinary ability to recognise rare numerical patterns instantly

Why 1729 Was Not a Coincidence

- Ramanujan had already studied similar problems in his notebooks

His work was connected to:

- Euler's studies on cubes
- **Fermat's Last Theorem**, which states that no two cubes can add up to another cube

- If 93+1039^3 + 10^393+103 had equalled 12312^3123, it would have violated Fermat's theorem
- Ramanujan was fascinated by such **"near misses"**
- This shows his insight was based on systematic exploration, not random intuition

The Ramanujan Machine

What Is It?

- Developed by scientists at Technion – Israel Institute of Technology
- Not a physical machine, but an algorithm

$$\frac{8}{\pi^2} = 1 - \cfrac{2\cdot 1^4 - 3\cdot 1^3}{7 - \cfrac{2\cdot 2^4 - 3\cdot 2^3}{19 - \cfrac{2\cdot 3^4 - 3\cdot 3^3}{37 - \cfrac{2\cdot 4^4 - 3\cdot 4^3}{61 - \ddots}}}}$$

How It Works

- **Traditional computing:** problem → solution

Ramanujan Machine:

- Input a constant (*e.g.*, π)
- Outputs a conjectured equation or infinite series
- Humans must then prove it mathematically

Why it's named after Ramanujan

Reflects Ramanujan's method:

- He proposed bold, elegant formulas
- Others later supplied rigorous proofs
- Ramanujan discovered many formulas for π
- All 17 of his π series were proven decades later
- One such formula was used to compute over 17 million digits of π, a world record at the time

Why This Matters

- Conjectures are essential for mathematical progress
- New conjectures have become increasingly rare

The Ramanujan Machine aims to:

- Accelerate discovery
- Assist mathematicians in uncovering new mathematical truths
- It blends human creativity with computational power

QUESTIONS

36. The Hardy–Ramanujan number 1729 is significant because it:

A. Is the smallest prime number discovered by Ramanujan

B. Is the smallest number expressible as the sum of two cubes in two different ways

C. Violates Fermat's Last Theorem

D. Represents the largest taxi number in England

37. With reference to the *Ramanujan Machine*, consider the following statements:

1. It is an algorithm designed to generate mathematical conjectures.
2. It automatically proves the conjectures it generates using AI.
3. It is named after Ramanujan because it mirrors his style of proposing formulas without proofs.

Which of the statements given above are correct?

A. 1 and 2 only
C. 2 and 3 only
B. 1 and 3 only
D. 1, 2 and 3

38. The movie 'The Man who knew Infinity' depicts the life story of _____.

A. Apurba Ramchandran
C. Venki Ramakrishna
B. Srinivasa Ramanujan
D. Aryabhatta

39. Who among the following is the author of the books **"The India Way"** and **"Why Bharat Matters"**?

A. Bhupender Yadav
C. Shashi Tharoor
B. Nalin Mehta
D. Subrahmanyam Jaishankar

ANSWER KEY AND EXPLANATION

1. A 1 and 3 only

- **Statement 1 is correct:** Personality rights protect against unauthorised commercial use of identity attributes.
- **Statement 2 is incorrect:** India has **no standalone statute** on personality rights.
- **Statement 3 is correct:** Courts trace these rights to **Article 21 (privacy, dignity, autonomy)**.
- **Statement 4 is incorrect:** Courts balance personality rights with **free speech**, allowing satire, journalism, and parody.

2. A 1, 2 and 3 only

- **Statements 1, 2, and 3 are correct:** Copyright law, trademark law, and passing off actions are key legal bases.
- **Statement 4 is incorrect:** Personality rights also stem from **constitutional rights**, not only IP law.

3. A 2, 3 and 4 only

- **Statement 1 is incorrect:** Commercial misuse is **not protected speech**.
- **Statements 2, 3, and 4 are correct:** Courts allow creative expression but prohibit exploitative, deceptive, or AI-generated misuse.

4. C Article 21

- In the landmark judgment Justice K. S. Puttaswamy (Retd.) and Anr. v. Union of India (2017), a nine-judge Constitution Bench of the Supreme Court unanimously held that the Right to Privacy is a fundamental right. The Court ruled that privacy is intrinsic to life and personal liberty and therefore forms an integral part of Article 21 of the Constitution, which guarantees the right to life and personal liberty.

5. C Article 21 and the freedoms guaranteed in Part III

- The correct answer is Article 21 and the freedoms guaranteed in Part III. In the landmark judgment Justice K. S. Puttaswamy (Retd.) v. Union of India (2017), the Supreme Court held that the Right to Privacy is a fundamental right and is intrinsic to the Right to Life and Personal Liberty under Article 21. The Court further clarified that privacy also draws strength from other fundamental freedoms guaranteed in Part III of the Constitution, such as freedoms under Article 19 (speech, movement, association, etc.), since privacy enables the meaningful exercise of these rights.

6. C Only three

- **Statement 1 – Correct:**

  The new benchmark defines Aravalli Hills based on **100 metres local relief**, includes slopes and adjacent land, and counts land between two hills within 500 metres as Aravalli, regardless of elevation.

- **Statement 2 – Incorrect:**

  The government has stated that mining will be permitted in only **0.19% of the Aravalli region**, not one-fifth. Hence, this statement exaggerates the mining scope.

- **Statement 3 – Correct:**

  Protected areas such as **tiger reserves (*e.g.*, Sariska, Ranthambhore), national parks, wildlife sanctuaries, ESZs, wetlands, and compensatory afforestation plantations** continue to enjoy legal protection independent of the new definition.

- **Statement 4 – Correct:**

  Comparative assessments show that **about 99% of areas earlier identified by the FSI using the 3-degree slope method would be excluded**, especially in Rajasthan, making this statement accurate.

7. B Only two

- **Statement 1 – Correct:**

  The Aravallis play a crucial climatic role by **checking desertification** and limiting the spread of the Thar Desert eastwards.

- **Statement 2 – Incorrect:**

  Guru Shikhar (1,722 m) is located in **Mount Abu, Rajasthan**, not Gujarat.

- **Statement 3 – Correct:**

  The Aravalli Range stretches across **Gujarat, Rajasthan, Haryana, and Delhi (NCT)**.

- **Statement 4 – Incorrect:**

  The Aravalli Range is among the **oldest mountain ranges in the world** (over 1.5 billion years old), not the youngest. Hence, only **two statements are correct**.

8. B Only two

- **Statement 1 – Incorrect:**

  The new benchmark uses **local relief**, not a fixed sea-level baseline, which critics argue excludes many genuine hills.

- **Statement 2 – Correct:**

  Using **district-level average slopes** can hide real hill systems because plains reduce the average.

- **Statement 3 – Incorrect:**

  Illegal mining is not clearly addressed, and environmental groups warn of future expansion into newly excluded areas.

- **Statement 4 – Correct:**

  Low-height Aravalli extensions in Delhi–NCR risk losing protection, potentially opening land for real estate development. Thus, **only two statements (2 and 4)** are correct.

9. D Only A and D are correct

- **Statement A – Correct:**

  The Aravalli Range acts as a **natural barrier against desertification** by restricting the eastward spread of the Thar Desert into eastern Rajasthan and adjoining regions.

- **Statement B – Incorrect:**
  - **Not all rivers of Rajasthan originate from the Aravalli Range.**
  - While rivers like **Banas, Luni, and Sabarmati** originate in or near the Aravallis, others such as **Chambal, Mahi, and Banganga** originate outside the Aravalli system.

- **Statement C – Incorrect:**
  - The **Aravalli Range does affect rainfall distribution** in Rajasthan.
  - Because the range runs parallel to the southwest monsoon winds, it does not cause significant orographic rainfall, contributing to **low rainfall in western Rajasthan**.

- **Statement D – Correct:**
  - The Aravalli region is **rich in metallic and non-metallic minerals**, including **copper (Khetri belt), zinc, lead, marble, and mica**, making it an important mineral belt

10. B 1, 2 and 4 only

- **Statement 1 is correct:** The **Luni River** originates near Pushkar/Ajmer, flows westward through the Thar Desert, and ultimately drains into the **Rann of Kutch**. It is an **ephemeral river system**. Luni is the largest river system of Rajasthan, west of Aravali. It originates near Pushkar in two branches, *i.e.* the Saraswati and the Sabarmati, which join with each other at Govindgarh. From here, the river comes out of Aravali and is known as Luni. It flows towards the west till Telwara and then takes a southwest direction to join the Rann of Kuchchh.
- **Statement 2 is correct:** The **Sabarmati River** originates from the Aravalli Hills near Udaipur and flows into the **Gulf of Khambhat**.
- **Statement 3 is incorrect:** The **Banas River** flows **eastward**, not westward, and joins the **Chambal River**, a tributary of the Yamuna.
- **Statement 4 is correct:** The **Sahibi River** flows from the Aravalli Range towards the **Yamuna river system**, along with tributaries such as Dohan and Krishnavati.

11. B 1 and 3 only

- Statement 1 is correct as the SHANTI Bill replaces both earlier nuclear laws. Statement 2 is incorrect because the target of 100 GW nuclear capacity is set for **2047**, not 2030. Statement 3 is correct since the Bill opens nuclear power generation to private players.

12. B 1 and 3 only

- Statement 1 is correct as sensitive activities like uranium enrichment remain government-controlled. Statement 2 is incorrect because reprocessing of spent fuel is **not** permitted for private entities. Statement 3 is correct as high-level radioactive waste management remains with the government for safety and security reasons.

13. C 1 and 3 only

- Statement 1 is correct as the Bill removes supplier liability for equipment defects, retaining only contract-based or intentional liability. Statement 2 is incorrect because mandatory insurance applies **only to private operators**, not government installations. Statement 3 is correct since the Bill grants statutory status to AERB to ensure regulatory autonomy.

14. B Some use imported uranium and others use domestic supplies

- After the **India–US Civil Nuclear Agreement (2008)** and the subsequent waiver from the **Nuclear Suppliers Group (NSG)**, India agreed to place its **civilian nuclear facilities that use imported nuclear fuel** under **IAEA safeguards**. This ensures that imported uranium and nuclear materials are used **only for peaceful purposes**.
- Reactors that use **domestically sourced uranium**—primarily linked to India's **strategic nuclear programme**—are **not placed under IAEA safeguards** to preserve national security and strategic autonomy.

15. A The civilian nuclear reactors come under IAEA safeguards.

- The **Additional Protocol** is a legal instrument that **strengthens the IAEA's ability to verify** that nuclear material and activities are used **exclusively for peaceful purposes**.

- In India's case, ratifying the Additional Protocol means that **designated civilian nuclear facilities**—already identified under India's separation plan—are placed under **enhanced IAEA safeguards**. This improves transparency and builds international confidence in India's civil nuclear programme.
- Importantly, **India follows a facility-specific safeguards model**, not a comprehensive one. Only **civilian reactors declared by India** are subject to IAEA oversight.

16. C Exploit India's abundant thorium reserves

- India has **limited uranium but large thorium reserves**, so the three-stage nuclear programme—natural uranium, plutonium, and finally thorium—was devised to ensure **long-term energy security** using indigenous resources.

17. B NPCIL and Atomic Energy Regulatory Board

- The **Nuclear Power Corporation of India Limited (NPCIL)** operates nuclear power plants, while the **Atomic Energy Regulatory Board (AERB)** ensures safety, regulation, and radiation protection in line with international standards.

18. A 1 and 3 only

- Statement 1 is correct as the project focuses on **solar-powered space data centres for AI computation**.
- Statement 2 is incorrect because the **initial missions are for learning and validation**, not commercial use.
- Statement 3 is correct since **TPUs are central to Google's AI computing architecture**.

19. B 1 and 3 only

- Statement 1 is correct because space offers **continuous solar radiation**, reducing Earth's environmental burden.
- Statement 2 is incorrect as the **Outer Space Treaty prohibits national sovereignty claims** in space.
- Statement 3 is correct due to **Moon–Earth distance causing communication delays**.

20. A 1 and 2 only

- Statement 1 is correct as **Nvidia launched Starcloud with an H100 GPU**.
- Statement 2 is correct since **Lonestar deployed a small lunar data centre**.
- Statement 3 is incorrect because these projects are **experimental, not commercially scaled**.

21. A 1 and 3 only

- Statement 1 is correct as New Zealand has committed to **zero duties on all Indian exports**.
- Statement 2 is incorrect because **sensitive Indian agricultural products like dairy are protected**.
- Statement 3 is correct, with both countries targeting **doubling of bilateral trade in five years**.

22. A 1 and 2 only

- Statements 1 and 2 are correct as the FTA **prioritises services trade and people mobility**, including longer post-study work rights.
- Statement 3 is incorrect because the agreement includes **broader mobility provisions**, not limited to business visitors.

23. A 1 and 2 only

- Statement 1 is correct as the FTA is widely described as **India's first women-led trade agreement**.
- Statement 2 is correct due to the **$20 billion investment facilitation commitment**.
- Statement 3 is incorrect because the agreement was **negotiated rapidly in about nine months**.

24. A 1 and 2 only

- Statement 1 is correct as India balances **export expansion with domestic sector protection**.
- Statement 2 is correct because the **India–ASEAN FTA covers goods and services**.
- Statement 3 is incorrect since India–Mercosur is a **Preferential Trade Agreement (PTA)**, not a CEPA.

25. C Only five

- India has FTAs/RTAs with ASEAN, Japan, South Korea, Singapore, Malaysia, Australia, UAE, Mauritius, EFTA (Iceland, Liechtenstein, Norway, Switzerland), Sri Lanka, Nepal, Bhutan, and the SAARC bloc (South Asia), plus recent ones like the UK (ECTA) and EFTA (TEPA), while negotiating with Canada, GCC, US, Peru, and others, focusing on reducing tariffs and boosting trade in goods/services.

26. A 1 and 2 only

- Statements 1 and 2 are correct as the project is a **run-of-the-river scheme with small pondage and total capacity of 2000 MW (8×250 MW)**.
- Statement 3 is incorrect because it is **not a pumped-storage project**.

27. C 1, 2 and 3

- All three statements are correct. The project features a **116-m concrete gravity dam**, maintains a **flood cushion of 442 million cubic metres**, and includes **record-breaking hydro-engineering components**.

28. A 1 and 3 only

- Statements 1 and 3 are correct as the Subansiri originates in **Tibet**, flows through **Arunachal Pradesh and Assam**, and joins the **Brahmaputra**.
- Statement 2 is incorrect because it is **not part of the Ganga system**.

29. D 1, 2 and 3

All the three rivers listed are important **tributaries of the Brahmaputra River**:

- **Dibang**: It is a major left-bank tributary of the Brahmaputra, originating in the Tibetan region and flowing through Arunachal Pradesh.
- **Kameng (Jia Bharali)**: It is a right-bank tributary of the Brahmaputra, originating in Arunachal Pradesh and entering Assam.
- **Lohit**: It is one of the principal tributaries of the Brahmaputra and joins it in Assam; along with Dibang and Tsangpo, it forms the Brahmaputra system.

Hence, **statements 1, 2, and 3 are correct**, making **option (d)** the correct answer.

30. B 1, 2 and 3 only

- The Brahmaputra River has significant tributaries joining from both banks, with major Right Bank (North) tributaries including Subansiri, Kameng, Manas, Sankosh, Teesta, and Jaldhaka, while important Left Bank (South) tributaries feature Dibang, Lohit, Dhansiri, Burhi Dihing, Kopili, Desang, Dikhow, and Kolong. These tributaries bring diverse flows, with northern ones often originating in the Himalayas and southern ones flowing from the hills of Northeast India.

31. B 1 and 3 only

- Statement 1 is correct as BlueBird Block-2, weighing about 6,100 kg, is the heaviest payload launched by ISRO.
- Statement 2 is incorrect because the satellite was placed in **Low Earth Orbit (~520 km)**, not GTO.
- Statement 3 is correct since LVM-3 was earlier called **GSLV-Mk III**.

32. A 1 and 2 only

- Statement 1 is correct as the satellite is designed by **AST SpaceMobile (USA)**.
- Statement 2 is correct since it allows **direct smartphone connectivity without ground infrastructure**.
- Statement 3 is incorrect because BlueBird Block-2 supports **4G and 5G voice, video, messaging, streaming, and data services**.

33. C 1, 2 and 3

- Statement 1 is correct as LVM-3, originally designed for GSO missions, is now used for LEO deployments.
- Statement 2 is correct since the semi-cryogenic engine upgrade raises LEO payload capacity from ~8,000 kg to ~10,000 kg.
- Statement 3 is correct because **bootstrap reignition** enables autonomous engine restart without external pressurising gases.

34. A 1 only

- **Statement 1 is correct.**

  PSLV (Polar Satellite Launch Vehicle) is primarily used to launch **Earth observation and remote sensing satellites** into polar and sun-synchronous orbits, which are useful for Earth resources monitoring. GSLV (Geosynchronous Satellite Launch Vehicle) is mainly designed to place **communication satellites** into geosynchronous or geostationary orbits.

- **Statement 2 is incorrect.**

  Satellites that appear fixed over a point on Earth are **geostationary satellites**, which are launched using **GSLV**, not PSLV. PSLV places satellites in **polar or sun-synchronous orbits**, where they move relative to the Earth's surface.

- **Statement 3 is incorrect.**

  GSLV Mk III (LVM-3) is a **three-stage launch vehicle**, not four-stage. It consists of:

  - Two solid strap-on boosters (first stage),
  - A liquid core stage (second stage),
  - A cryogenic upper stage (third stage).

35. C Four statements only

- **Statement 1 is correct.**

  PSLV is classified as a **third-generation launch vehicle** of India, following SLV-3 and ASLV.

- **Statement 2 is correct.**

  PSLV was the **first Indian launch vehicle to use liquid propulsion stages**, marking a major technological advancement in ISRO's launch capability.

- **Statement 3 is correct.**

  PSLV is primarily designed for **polar and sun-synchronous orbits**. Due to its unmatched reliability, PSLV has also been used to launch various satellites into Geosynchronous and Geostationary orbits, like satellites from the IRNSS constellation.

- **Statement 4 is incorrect.**

  PSLV **cannot carry 7,000 kg** to Sun-Synchronous Orbit. This payload capacity is far beyond PSLV's design limits.

- **Statement 5 is correct.**

  PSLV can carry **around 1,750 kg** of payload to a **600 km Sun-Synchronous Polar Orbit**, which matches its proven capability.

36. B Is the smallest number expressible as the sum of two cubes in two different ways

- 1729 is the **smallest number that can be expressed as the sum of two cubes in two different ways**:
- $1^3 + 12^3 = 1729$ and $9^3 + 10^3 = 1729$.
- This property was instantly recognised by Srinivasa Ramanujan in the famous taxi anecdote with G. H. Hardy.

37. B 1 and 3 only

- The Ramanujan Machine is **not a physical machine**, but an **algorithm** that generates conjectures and elegant formulas, leaving **proofs to human mathematicians**. It is named after Ramanujan because he famously proposed results first, with proofs coming later.

38. B Srinivasa Ramanujan

- The movie "The Man Who Knew Infinity" is a biographical drama that depicts the life of Srinivasa Ramanujan, one of India's greatest mathematicians. The film was released in 2015 and is based on the biography of the same name written by Robert Kanigel. Alexander Dunn from Georgia Tech has been awarded the 2024 SASTRA Ramanujan Prize for his significant contributions to analytic number theory, particularly for solving the Kummer-Patterson Conjecture on bias in cubic Gauss sums in collaboration with Maksym Radziwill. The SASTRA Ramanujan Prize is an annual award given to mathematicians under the age of 32 for exceptional contributions to the field of mathematics. The award was established in 2005 by the Shanmugha Arts, Science, Technology & Research Academy (SASTRA) in Kumbakonam, Tamil Nadu, India. The prize is named after the famous Indian mathematician Srinivasa Ramanujan.

39. D Subrahmanyam Jaishankar

- Option **(D)** is correct. **Dr. Subrahmanyam Jaishankar**, India's External Affairs Minister, is the author of both **"The India Way"** and **"Why Bharat Matters."**
- **"The India Way"** explains India's evolving foreign policy, strategic autonomy, and approach to global diplomacy in a multipolar world.
- **"Why Bharat Matters"** builds on this perspective by highlighting India's civilisational outlook, national interests, and growing global influence.

The other options are incorrect as they have not authored these works.