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PRELIMS EDGE 2025 **25-08-2025**

GAGANYAN MISSION

Context: ISRO recently completed the first integrated air drop test for Gaganyaan Mission.

About the Mission

- The Gaganyaan Mission is India's ongoing project to send a 3-day manned mission to the Low Earth Orbit (LEO) of 400 km with a crew of 3 members and bring them safely back to Earth.
- As part of this program, two unmanned missions and one manned mission are approved by the Government of India.
- The first manned spaceflight is expected to take place before 2026.
- The success of the Gaganyaan Mission will put India in the elite group of nations (US, Russia, and China) having human space flight capability.

Mission Objectives

- The Gaganyaan Mission is an ambitious and co-ordinated project of ISRO in collaboration with other agencies, such as various research labs, Indian academia, and industries, with the following objectives:
- **To undertake human space flights:** Its immediate aim is to demonstrate indigenous capability to undertake human space flights.
- **Space exploration:** In the long run, it will lay the foundation for a sustained Indian human space exploration programme.
- **Conduct Experiments:** As part of the mission, Gaganyaan also encourages and supports micro-gravity experiments.

Technologies Required for ISRO's Gaganyaan Mission

- In order to ensure crew safety in this programme, various precautionary and safety measures were required. In this regard, ISRO required major new technologies for the Gaganyaan Mission such as Human rated launch vehicle, a habitable orbital module, crew escape systems, and a life support system.

Human-Rated LVM3

- A modified version of ISRO's most-reliable rocket, LVM3 (previously called Geosynchronous Satellite Launch Vehicle Mk III), is the launching vehicle of the Gaganyaan Mission.

- It is re-configured as a human rated launch vehicle to be capable of safely transporting humans into the intended orbit.
- It has a three stage propulsion system – solid stage, liquid stage, and cryogenic stage.
- It consists of Crew Escape System (CES) as well as Orbital Module, along with solid stage, liquid stage, and cryogenic stage.

Orbital Module (OM)

- It will be orbiting Earth, comprising the Crew Module (CM) and Service Module (SM). The Orbital Module is equipped with state-of-the-art avionics systems with adequate redundancy.

Crew Module (CM):

- It is a habitable space with an Earth like environment for the onboard crew members. It will consist of a human habitable module with a control system for the mission, crew communication, navigation, guidance, and avionics system.

Structure of CM:

- It has a double-walled rigid construction consisting of a pressurized metallic inner structure and an unpressurized external structure with a Thermal Protection System (TPS).
- It houses human centric products, life support systems, avionics, crew interfaces, and deceleration systems.
- This module has also been designed for re-entry facility to earth atmosphere ensuring safety of the crew during descent till touchdown.

Service Module (SM):

- It will be used for providing necessary support to the Crew Module while in orbit.
- It is an unpressurized structure containing the propulsion system, thermal system, power systems, avionics systems and deployment mechanisms.

Crew Escape System

- To ensure theAstronauts' safety, various In-flight Abort Demonstrations of Crew Escape System (CES) have been included.

Flight Test Vehicle Abort Mission-1 (TV-D1):

- It is the first of the two abort missions to test the safety mechanisms and demonstrates the performance of the Crew Escape System of the Gaganyaan Mission.
- This has also confirmed the functioning of systems for separating the crew module from the rocket in case of a mid-flight emergency (abort and escape mission of the astronauts).
- Hence, it will allow the Gaganyaan crew to leave the spacecraft in an emergency.

Life Support System

- Life Support System to provide an earth like environment to crew in space, crew emergency escape provision and evolving crew management aspects for training, recovery and rehabilitation of crew members.
- Training Programmes for Gaganyaan Mission Crew Members
- Astronaut Training Facility established in Bengaluru caters to Classroom training, Physical Fitness training, Simulator training and Flight suit training.

- Training modules cover Micro-gravity familiarization through Parabolic Flights, Aero-medical training, Recovery & Survival training, Crew Training Simulators, Aero medical training, etc.

Different Phases of Gaganyaan Mission

- ISRO plans to execute two unmanned missions as part of the Gaganyaan mission projects before the final manned mission due to safety concerns of the project.
- **Testing phase:** Before executing the unmanned and manned mission, ISRO has planned to demonstrate numerous tests including the following ones:
    - **Integrated Air Drop Test (IADT):** This Test is intended to validate the deceleration system (parachute and pyro's) performance using an IAF chopper
    - **Pad Abort Test (PAT):** The test will involve dropping the crew module from a helicopter and will help understand the impact from various heights and velocity.
    - **Test Vehicle (TV) flights:** The Test Vehicle is a single-stage liquid rocket developed for this abort mission.
- **Unmanned missions:** It will be for technology demonstration, safety and reliability verification and will be heavily instrumented to study the performance of systems before crewed flight. Some advanced tests are:
    - **Airdrop test** for the parachute system, Flight test of the test vehicle, Abort test to demonstrate.
    - **Water Survival Test Facility (WSTF):** ISRO, along with the Indian Navy carried out WSTF to initial recovery trials of Crew Module in Feb 2023. The trials were part of the preparation for crew module recovery operations.
    - **Vyommitra:** The 'female' robot astronaut the humanoid designed and developed ISRO to fly aboard unmanned test missions before the Gaganyaan human space-flight mission.
- **Manned mission:** Human spaceflight module of Gaganyaan will be followed by the two unmanned missions.

Source : ISRO completes first integrated air drop test for Gaganyaan (The Hindu)

INTEGRATED AIR DEFENCE WEAPON SYSTEM

Context : The Defence Research and Development Organisation (DRDO) on Sunday announced it had successfully conducted the maiden flight tests of the Integrated Air Defence Weapon System (IADWS), a multi-layered air defence platform.

- It is a multi-layered air defense system, which includes three components — Quick Reaction Surface to Air Missiles (QRSAM),

the advanced Very Short Range Air Defence System (VSHORADS) missiles, and a high-power laser-based Directed Energy Weapon (DEW).

- QRSAM has been designed and developed by the DRDO, VSHORADS and DEW have been developed by Research Centre Imarat (RCI) and Centre for High Energy Systems and Sciences (CHESS) respectively, both Hyderabad-based facilities of the DRDO.
- The integrated operation of all these weapon system components is controlled by a Centralised Command and Control Centre, developed by the Defence Research and Development Laboratory, Hyderabad.

The Three Components of the IADWS

- **QRSAM:** It is a short-range Surface to Air Missile (SAM) system, primarily designed to provide a protective shield to moving armoured columns of the Army from enemy aerial attacks.
- The entire weapon system is configured on highly mobile platforms. It has search and track capability and can fire on short halts. The system has an operation range of three to 30 kilometers.
- The QRSAM weapon ensemble consists of a fully automated command and control system, two radars — Active Array Battery Surveillance Radar and Active Array Battery Multifunction Radar — and one launcher. Both the radars have a 360-degree coverage with 'search on move' and 'track on move' capabilities.
- **VSHORADS:** It is a fourth-generation, technically advanced miniaturised Man Portable Air Defence System (MANPAD). This missile system has the capability to meet the needs of all the three branches of the Armed Forces — Army, Navy and Air Force.
- **Directed Energy Weapon (DEW):** Earlier this April, the CHESS facility conducted a successful field demonstration of the land version of the Vehicle mounted Laser DEW MK-II(A).
- It defeated fixed wing UAV and swarm drones, causing structural damage and disabling their surveillance sensors. With this, India has joined the exclusive club of global powers who possess such a system. DEW is said to have a range of less than three kilometers.

Source : DRDO successfully tests indigenous air defence system, advancing 'Mission Sudarshan Chakra' goals for 2035 (The Indian Express)

TERMS IN NEWS

Archeological Survey of India

- It was established in the year **1861 by Alexander Cunningham.**
- After independence, it was established as a statutory body under the **Ancient Monuments and Archaeological Sites and Remains Act, 1958(AMASR Act).**
- ASI is responsible for archaeological **research and the conservation and preservation** of cultural monuments in the country.

- Its activities include carrying out **surveys of antiquarian remains**, exploration and excavation of archaeological sites, conservation and maintenance of protected monuments etc.
- **Concerned Ministry:** Ministry of Culture

Keeladi Findings

- Keeladi is a village in **Sivaganga district, Tamil Nadu, situated along the Vaigai River, about 12 km southeast of Madurai.**
- **Excavation History:** Excavations began in 2015, initially led by the ASI and later by the Tamil Nadu State Department of Archaeology after a period of administrative dispute.
- **Artefacts Unearthed:** Over 18,000 artefacts have been discovered, including pottery, inscribed potsherds, gold ornaments, copper articles, semi-precious stones, shell and ivory bangles, glass beads, spindle whorls, terracotta seals, and weaving tools.
- **Pottery and Inscriptions:** The site has yielded heaps of pottery and over 120 potsherds with Tamil Brahmi inscriptions, indicating the long survival of the script and literacy in the region.
- **Urban Settlement:** Findings suggest Keeladi was a well-planned urban settlement with evidence of industries such as pottery, weaving, dyeing, and bead-making.
- **Trade and Lifestyle:** Artefacts like agate and carnelian beads indicate trade networks, while items such as dice and hopscotch pieces reveal leisure activities.
- **Chronology:** The findings have pushed the Sangam Age in Tamil Nadu back to around 800 BCE, suggesting a much older and advanced civilization than previously thought.
- **Link to Other Civilisations:** Some symbols on Keeladi artefacts resemble those of the Indus Valley Civilization, though a cultural gap of about 1,000 years remains. Scholars hope further studies will clarify these connections.

Sangam Age

- The Sangam Age, often referred to as the Tamil Sangam period, marks an important chapter in South Indian history.
- Named after the assembly of Tamil poets and scholars known as the Sangam, this era witnessed a rich cultural and literary flourishing in the southern regions of India.
- It is broadly estimated to have spanned from around 300 BCE to 300 CE.

Matua Community

- The **Matua community, a marginalized Hindu sect with roots in the 19th century, holds a significant socio-religious presence in the Bengal region, particularly across Bangladesh and West Bengal**.

- Founded by **Harichand Thakur in the 1860s, the Matua movement arose as a response to the deep-seated caste discrimination present within Hindu society at the time.**
- As followers of the Matua faith, the community primarily belongs to the "Namashudra" caste, traditionally regarded as a lower-caste group within Hinduism.
- Harichand Thakur's teachings centered on principles of social equality, human dignity, and the empowerment of marginalized groups through education and religious reform, making the Matua movement a powerful counterforce to caste oppression.
- Following the partition of Bengal in 1947, the Matua community experienced profound socio-political shifts.
- Many Matua families migrated to India to escape religious and political persecution, although a large portion of the community remained in what later became Bangladesh.
- Today, Matuas constitute the second largest SC population of West Bengal.

SCHEMES IN NEWS

NAMASTE Scheme

- The objective of the "National Action for Mechanised Sanitation Ecosystem" (NAMASTE) scheme is to **formalize and institutionalize the persons engaged in hazardous cleaning of sewers and septic tanks and promoting safe and mechanized cleaning through trained sanitation workers.**
- **Ministries involved:** It is jointly being implemented by the Ministry of Social Justice and Empowerment (MoSJE) and the Ministry of Housing and Urban Affairs (MoHUA).
- **Implementing agency:** It is implemented by the National Safai Karmacharis Finance Development Corporation (NSKFDC) under the Ministry of Social Justice and Empowerment (MoSJE)
- **Duration:** It would be implemented for three years from FY 2023-24 to FY 2025-26.
- **Target Groups:** Sewer and septic tank sanitation workers (SSWs) and waste pickers in urban areas of India

Aims of NAMASTE Scheme

- Zero fatalities in sanitation work in India
- All sanitation work is performed by skilled workers
- No sanitation workers come in direct contact with human faecal matter
- Sanitation workers are collectivized into SHGs and are empowered to run sanitation enterprises
- All Sewer and Septic tank sanitation workers (SSWs) have access to alternative livelihoods.

PRACTICE QUESTIONS

Q1: Consider the following statements regarding the Gaganyan Mission

1. The Gaganyaan Mission is India's ongoing project to send a 3-day manned mission to the Mars
2. A modified version of ISRO's most-reliable rocket, LVM3 (previously called Geosynchronous Satellite Launch Vehicle Mk III), is the launching vehicle of the Gaganyaan Mission.
3. Vyommitra, The 'female' robot astronaut the humanoid designed and developed ISRO to fly aboard unmanned test missions before the Gaganyaan human space-flight mission.

How many of the above statements are correct?

A. Only One
B. Only Two
C. All of the Above
D. None of the Above

Q2: Consider the following statements regarding the Integrated Air Defense System

1. It is a multi-layered air defense system, which includes three components — Quick Reaction Surface to Air Missiles (QRSAM), the advanced Very Short Range Air Defence System (VSHORADS) missiles, and a high-power laser-based Directed Energy Weapon (DEW).
2. The integrated operation of all these weapon system components is controlled by a Centralised Command and Control Centre, developed by the Defence Research and Development Laboratory, Hyderabad.

How many of the above statements are correct?

A. Only Statement 1
B. Only Statement 2
C. Both the Statements
D. None of the Above

Q3: Consider the following statements regarding the NAMASTE Scheme

1. It aims to formalize and institutionalize the persons engaged in hazardous cleaning of sewers and septic tanks and promoting safe and mechanized cleaning through trained sanitation workers.
2. It is implemented by the National Safai Karmacharis Finance Development Corporation (NSKFDC) under the Ministry of Social Justice and Empowerment (MoSJE)

How many of the above statements are incorrect?

A. Only Statement 1
B. Only Statement 2
C. Both the Statements
D. None of the Above

Q4: Keeladi Village, Often seen in the news for the recent archeological excavations of ancient Sangam civilization is located at the banks of which of the following rivers?

A. Vaigai
B. Krishna
C. Mahanadi
D. Kaveri

Q5: The Matua community, a marginalized Hindu sect with roots in the 19th century. Founded by Harichand Thakur in the 1860s, the Matua movement arose as a response to

the deep-seated caste discrimination present within Hindu society at the time.

The Matua community was originated and spread across which of the following regions?

A. Punjab Plains
B. Bengal Deltaic region
C. Western Himalayas
D. Madras Province

Answers

1. B
2. C
3. D
4. A
5. B