Mains Practice Question

Q. India’s participation in the Axiom Mission marks a shift towards global human spaceflight collaboration. Analyze its implications for India’s space sector. (150 words)

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Approach :

- Briefly introduce the Axiom-4 Mission.
- Discuss its significance and implications for India’s space sector.
- Conclude with a suitable way forward

Introduction :

The **Axiom-4 Mission**, launched on **June 25, 2025**, represented India’s official return to crewed human spaceflight after more than four decades. This mission, organized by Axiom Space in partnership with **SpaceX, NASA, ESA**, and ISRO, carried a diverse international crew, with **Indian Air Force Group Captain Shubhanshu Shukla** serving as Mission Pilot.

Body :

Significance and the Shift Toward Global Collaboration:

- **Return to Space after Four Decades**: Shubhanshu Shukla’s journey comes 41 years after Rakesh Sharma, India’s first and only astronaut (1984), marking a historic milestone and India's return to the **crewed spaceflight community.**
- **Embracing International and Commercial Partnerships**: India’s involvement in a privately organized, multinational mission signals a transition from **bilateral, government-to-government missions to globally integrated, commercially driven collaborations.**
- **Learning through Global Platforms:** Shukla trained at Russia’s Gagarin Cosmonaut Center and with **NASA/ISRO assets,** gaining hands-on experience aboard the SpaceX Dragon and aboard the ISS, which operates under the aegis of five major space agencies.

Key Implications for India’s Space Sector

- **Direct Human Spaceflight Experience:** Indian teams participated in pre-launch, in-orbit, and ground operations at the highest level, gaining knowledge of international crew practices, orbital emergency management, and biomedical **monitoring, all crucial for future missions.**
- **Critical Learning Before Gaganyaan**: Lessons from **Axiom-4** are informing crew training, mission planning, astronaut medical protocols, and communication procedures for India’s upcoming Gaganyaan human spaceflight (uncrewed launch target: Dec 2025; crewed launch: 2026–27).
- **Technology Sharing:** The mission involved use of **indigenously developed experiment kits** (by IITs, IISc, DBT), testing Indian biotech, life science, and materials technology in true microgravity—unprecedented for Indian teams.
    - Experiments included studying the **growth of microalgae** (potential sustainable food for

long-duration missions), **protein** crystallization, and muscle cell research, directly benefiting Gaganyaan and space station planning.

- **Growth of Space Startups:** India's **space policy reforms** and such landmark missions have seen the number of space startups grow to over 328 by 2025. The sector's budget nearly tripled over the past decade, rising to ₹13,416 crore for 2025–26.
    - **Liberalized FDI norms** (up to 100% in many space activities), alongside platforms like IN-SPACe and NewSpace India Limited, are attracting foreign investment and sparking domestic entrepreneurship.
- **Recognition as a Trusted Partner:** Participation in an international crew and collaboration with top spacefaring nations showcase India as an equal, competent partner, building confidence for joint missions, shared research, and future space station collaborations.

Conclusion:

India's participation in the **Axiom-4 mission** positions India not just as a participant but as a **co-leader in global space exploration**. It also lays the groundwork for India's long-term vision of building the Bharatiya Antariksha Station by 2035, marking its steady rise toward a self-reliant and collaborative space future.