1. First Advance Estimates of India's GDP out: What are they, and what do the data show?

Why in news?
According to the First Advance Estimates (FAEs) released by the government, India's GDP will grow by 7.3% in the current financial year (2023-24), slightly faster than the 7.2% growth in 2022-23, on Friday showed.

How can GDP be estimated when there are still almost three months to go in the year?
The FAE are presented at the end of the first week of January every year. They are only the first estimates of growth for that financial year. By the end of February, the Ministry of Statistics and Programme Implementation (MoSPI) will release the Second Advance Estimates and, by the end of May, the Provisional Estimates.

The GDP estimates continue to be revised as more and better data become available — and in the coming three years, MoSPI will release the First, Second, and Third Revised Estimates of this year's GDP before settling on the final number, which is called the "Actuals".

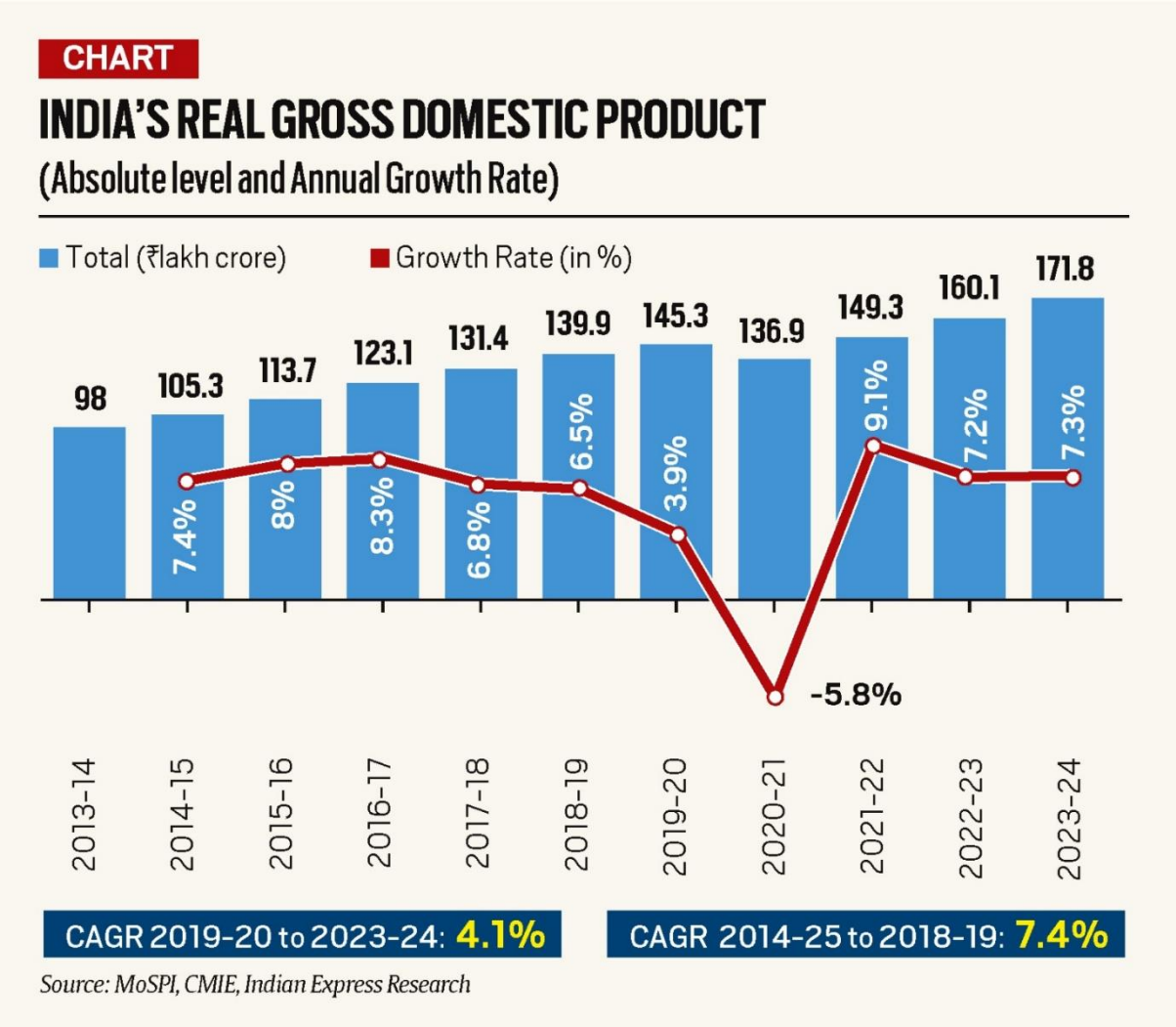
The FAE are based on the performance of the economy over the first seven-odd months, and the data are extrapolated to arrive at an annual picture.

If the data are not final, what is the point of the FAEs?
The crucial significance of the FAEs is that they are the last GDP data released before the Union Budget for the coming financial year (which is presented on February 1) is finalised. As such, the FAEs constitute the base for the Budget numbers. However, since

Lok Sabha elections will be held in April-May, a full-fledged Union Budget will not be presented this year.

This year's FAEs draw some additional significance from the fact that they provide the first complete picture of economic growth in the 10 years of the government led by Prime Minister Narendra Modi.

So what do the FAE data show?
The chart shows India's real GDP (GDP after stripping away the effect of inflation), both in absolute terms (in Rs lakh crore) and in terms of growth rate.



What is contributing to India's growth?
India's GDP is calculated by adding up all kinds of spending in the economy — the demand side of the economy. As such, there are four main "engines" of GDP growth.

***Spending by people in their individual capacity:** Technically this is called Private Final Consumption Expenditure (PFCE). It accounts for almost 60% of India's GDP.

***Spending towards investments in boosting the productive capacity of the economy:** This could be the building of a factory, companies buying computers for their offices, or governments building roads.
This is called Gross Fixed Capital Formation (GFCF), and is the second-largest engine of growth that typically accounts for 30% of the GDP.

***Spending by governments to meet daily expenditures such as salaries:** This is Government Final Consumption Expenditure (GFCE). It is the smallest engine, accounting for around 10% of GDP.

***Net exports or net spending as a result of Indians spending on imports and foreigners spending on Indian exports:** Since India typically imports more than it exports, this engine drags down GDP calculations, and shows up with a minus sign.

The table shows how each of these components has done in absolute and percentage terms.

TABLE

MAIN ENGINES OF INDIA'S GDP

Absolute level (in ₹ lakh crore) and Annual Growth Rate (in %)

Year	PFCE		GFCE		GFCF		Net Exports	Growth Rate in NX*
	Private spending	Growth rate	Govt spending	Growth rate	Spending for investments	Growth rate		
2013-14	55.6		9.8		31.9		-1.8	
2014-15	59.1	6.4%	10.5	7.1%	32.8	2.5%	-1.6	-11.8%
2015-16	63.8	7.9%	11.3	6.9%	34.9	6.1%	-1.4	-9.1%
2016-17	69	8.1%	12	5.7%	37.9	7.8%	-1.3	-5.7%
2017-18	73.3	6.2%	13.4	10.7%	40.8	7.2%	-4.8	257.6%
2018-19	78.5	7.1%	14.3	6.3%	45.4	10.1%	-4.4	-8.2%
2019-20	82.6	5.2%	14.9	3.8%	45.9	1.1%	-5.1	16.1%
2020-21	78.2	-5.2%	14.8	-0.9%	42.6	-7.9%	-3.1	-38.8%
2021-22	87	11.2%	15.8	6.2%	48.8	12.8%	-1.9	-39.6%
2022-23	93.6	7.5%	15.8	0.1%	54.3	10.2%	-3.4	79.7%
2023-24	97.7	4.4%	16.4	3.9%	59.9	9.3%	-8.2	144.2%
2019-20 to 2023-24@		4.5%		2.8%		5.6%		13.3%
2014-25 to 2018-19@		7.1%		7.9%		7.3%		19.6%

@Compounded Annual Growth Rate between
Source: MoSPI, CMIE, Indian Express Research

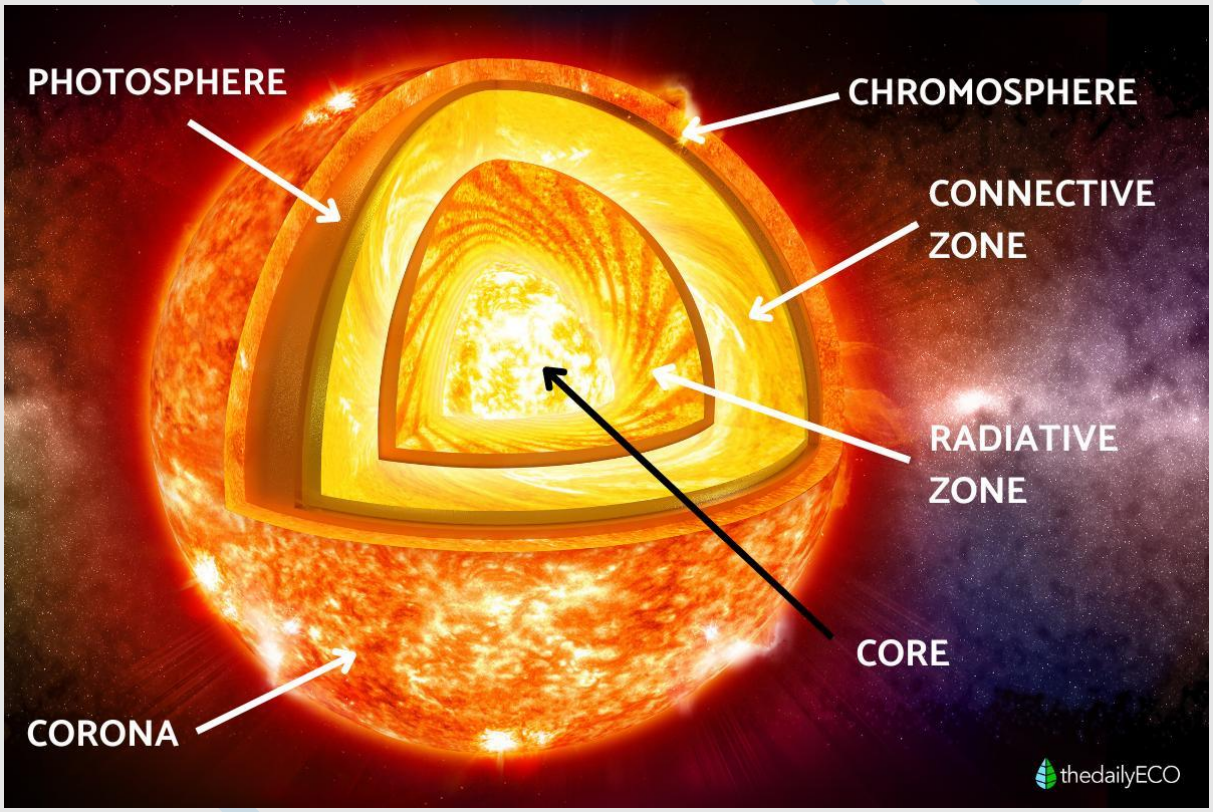
**a negative growth is good in India's case*

Relevance: GS Prelims & Mains Paper III; Economics

2. Why ISRO's Aditya spacecraft is at 'L1', what it means

Aditya-L1 was launched by ISRO on September 2, 2023, with the mission of observing and helping us better understand the Sun. It arrives at its destination, L1 or the first Sun-Earth Lagrangian point, on January 6.

But first, why study the Sun?
The Sun produces energy through nuclear fusion in its interior, and emits it from its outer layers. The photosphere, a 6,000-degree Celsius layer, emits all visible and infrared light, crucial for life. Above is the chromosphere, and higher still is the million-degree Celsius hot corona.



Interestingly, the corona is much hotter than the inner layers of the Sun — there must be some energy source which provides this heat. However, the processes involved in this are not yet fully understood. Moreover, it also emits ultraviolet and X-ray radiation

which would be lethal to life on Earth, without the presence of the atmosphere which absorbs most harmful radiation.

The Sun also continuously streams electrically charged particles — a stream known as the Solar wind. These charged particles produce the spectacular aurorae, known as the Northern and Southern Lights, seen close to the north and south poles of the Earth.
There are also sudden bursts and ejections of charged particles from the Sun into interplanetary space, known as Solar flares and coronal mass ejections. These directly affect space weather, space-reliant technologies like satellite communication networks, and can produce electric power blackouts in Earth's higher latitudes. Notably, they can be extremely difficult to predict.

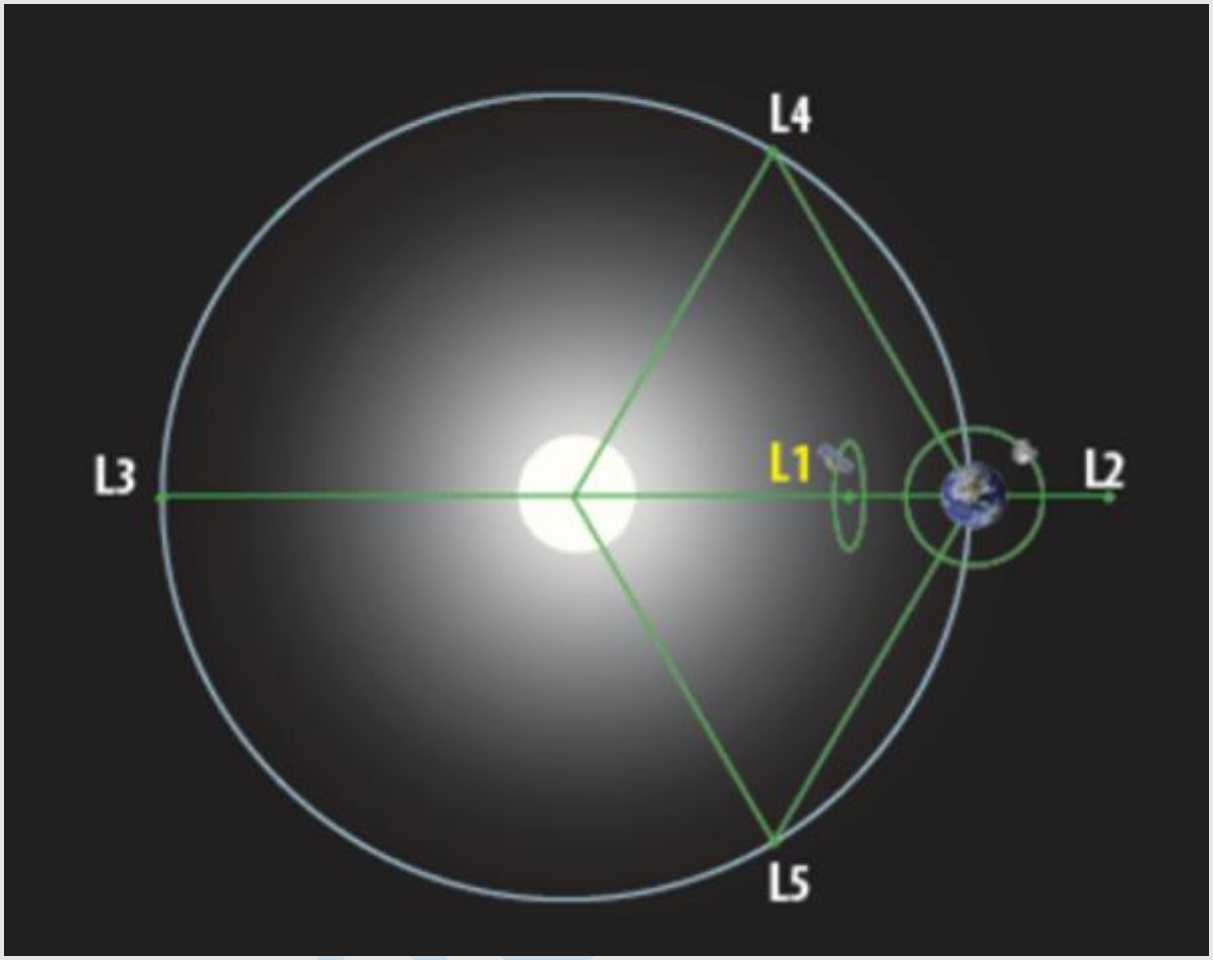
What will Aditya-L1 do?
Since Aditya-L1 is located outside the Earth's atmosphere, its instruments can observe the ultraviolet radiation from the corona, and in the process, better understand its workings. Moreover, we need to monitor the Solar atmosphere and the corona continuously to monitor eruptions on the Sun, and study the properties of charged particles in the Solar wind.

Crucially, this task has to be carried out from outside Earth's atmosphere, and as close to the Sun as possible. This will then help provide early warning of Solar eruptions, and allow us to initiate actions to minimise the disruption they may cause.

Aditya-L1 has seven instruments for the observation of all the radiation and charged particles. Its location, 1.5 million km away from Earth towards the Sun (more on that next), allows uninterrupted observations.

What is L1, the location of Aditya?
L1 stands for the first Lagrangian point — there are five such points, L1 to L5, associated with the motion of one astronomical body around another one, in Aditya's case, Earth and the Sun. These points were theoretically discovered by the Swiss mathematician Leonhard Euler and the Italian-French mathematician Joseph-Louis

Lagrange in the 19th century. We are particularly concerned here with points L1 and L2 because of their relevance to space missions.



When a spacecraft is in orbit around Earth, it is affected by the gravitational force exerted on it by the planet. Yet it does not fall to Earth's surface because effectively, Earth's gravity is balanced by a centrifugal force which arises due to the motion of the spacecraft around the Earth.

The Earth's gravitational pull on a spacecraft gets ever so weaker the further it moves from the planet. Eventually, there comes a point where Earth's gravitational force becomes comparable that exerted by the Sun. If a spacecraft moves any further, it will get pulled into orbit around the sun, or eventually crash into it, depending on its speed. L1 is the sweet spot between Earth and the Sun, where the gravitational force exerted on a spacecraft by the two celestial bodies, and the centrifugal force cancel each other. As a result, once placed exactly at L1, Aditya would always continue to remain there without expending any energy.

Does this mean that Aditya is at a stationary point in space?

No. As Figure 1 shows, L1 is on the line joining the Sun and the Earth. As Earth rotates around the Sun, L1 goes around the Sun too, while always remaining on the same line.

Thus, rather than being at the same point in space, Aditya will remain at the same position, relative to the Sun and Earth.

In fact, the L1 point itself is fundamentally unstable — a tiny pull or push can send the spacecraft hurtling away in some other direction. To avoid this, Aditya is placed in an orbit around L1.

A complex orbit nearly perpendicular to the line joining the Sun and Earth, it will take the spacecraft about 178 days to complete one full orbit.

Why L1?

Putting Aditya in orbit around the Earth would have made the mission much simpler. However, this would also mean that Earth would cover Aditya's view of the Sun for significant periods of time. While the duration of such eclipses can be reduced by choosing the correct orbit, it cannot be fully eliminated. Given that Aditya is meant to act as an early warning system for solar flares and coronal mass ejections, is necessary to have an uninterrupted view of the Sun.

When Aditya is at L1, the Earth is always on one side of it, and the Sun on the other side. Thus, the spacecraft's instruments can be pointed towards the Sun for a completely uninterrupted view. Even though placing the spacecraft at an orbit around L1 is complex, the benefits of having an uninterrupted view of the Sun at all times is well worth the effort, risk, and expense.

A few space missions are already parked around the L1 point, including the LISA Pathfinder, and Solar and Heliospheric Observatory (SOHO), both collaborative missions of NASA and European Space Agency.

And what about L2?

While the L1 is the ideal point to observe the Sun, L2 is a very useful staging point for spacecraft to be used for observing the distant Universe. As can be seen from Figure 1, L2 also is along the line joining the Sun and Earth, but it is on the opposite side of the Earth, at about 1.5 million kilometres.

So, a spacecraft in a halo orbit around L2 can have all its instruments pointing away from the Earth, to get an uninterrupted view of the deep space. The James Webb Space Telescope (JWST), Gaia and Euclid are some of the important astronomical probes which are presently in orbit around L2. The Planck mission, which carried out path breaking observations of the cosmic microwave background radiation was also located there.

Relevance: GS Prelims & Mains Paper III; S&T
Source: The Indian Express

3. Why did the Islamic State attack Iran?

What has happened?

The Islamic State terror group claimed responsibility for Wednesday's bomb attacks at a memorial event in Kerman for Qassem Soleimani, the Iranian General who was killed by the U.S. in January 2020. Soleimani, commander of the Quds Force, an elite wing of Iran's Islamic Revolutionary Guard Corps (IRGC), was a sworn enemy of the Islamic State when he was alive. The Kerman bombing, in which at least 84 people were killed and over 200 injured, was the third major attack claimed by the Islamic State (IS) in the Islamic Republic of Iran, which shows the growing threat of terrorism Tehran is facing. The attack comes at a time when fears of a regional war, involving Israel and Iran, are on the rise in West Asia.

Why does the IS target Iran?

The IS, which is a Sunni Salafi-Jihadist outfit, sees Iran, a Shia theocracy, as an ideological rival and battlefield enemy. The IS is notorious for its sectarian violence against the Shias, who they call the Rafidha (rejectionists — a derogatory term used by Sunni extremists to refer to the Shias. They say the Shia community has rejected the first three [Sunni] Caliphs of Islam, Abu Bakr, Umar and Uthman). For the IS, Shias are not real Muslims — they are apostates who follow shirk (idolatry). In the IS-controlled territories of Iraq and Syria (from 2014 to 2018), Shias faced systemic persecution and violence. Even after the IS lost the territories and shifted the focus of their operations to the lawless lands of eastern Afghanistan, they continued to attack Afghanistan's Hazara Shia minority.

The IS also sees Iran as a formidable rival in the battlefield as Iran-backed militias played a key role in defeating the jihadists in parts of Syria and predominantly in Iraq. In March 2017, the Wilayat Diyala, the Iraq-based unit of the IS, had released its first propaganda video in Farsi, titled 'Persia between yesterday and today', urging Iranian Sunnis to declare allegiance to the 'Caliphate' and rise against — and topple — the Iranian regime. Since then, the IS has carried out high-decibel propaganda in Persian. The IS wanted to expand their sphere of operations from Afghanistan to "other nearby lands", primarily Iran. In three months after the video was released, the IS carried out a coordinated attack on Iran's Parliament and the mausoleum of Ayatollah Khomeini, killing at least 17 people. It was a declaration of war by the Islamic State on the Islamic Republic.

How does Iran look at the IS?

Iran sees in the IS a bid to revive the deadly conflict of the early years of Islam between the Sunnis and the Shias. With their anti-Shia propaganda and violence, the IS wants to whip up sectarian passions among hardline Sunnis and trigger a wider war, targeting both Shia communities in Sunni majority countries as well as Iran. It also saw the IS as an immediate security threat. Unsurprisingly, Iran was the first country that rushed aid

to Iraq when the IS started gaining territories in Iraq. In June 2014, immediately after the IS captured Mosul, Iraq's second largest city, and surrounding areas, Iran despatched IRGC units to protect Baghdad and the holy Shia cities of Najaf and Karbala. By December 2014, well before the Western-backed counter-attack against the IS began, Iran had started carrying out air strikes on IS areas in Iraq. Iran's state organs frequently called the IS a "terrorist organisation" or Taqfiris (those who excommunicate fellow Muslims and mostly use violence against them).

In the medium term, Iran formed a strategy of fighting the IS through Shia mobilisation units. It recruited, trained and dispatched militias to Syria where the regime of Bashar al-Assad was fighting a civil war against a host of rebels and jihadists, including al-Qaeda and the IS. In Iraq, the Shia militias fought alongside the Iraqi army and the Kurdish Peshmerga militias, under American air cover, against the IS. They played a critical role in defeating the IS's physical structures and liberating Iraqi cities from the jihadists. The man behind these anti-IS operations was Major General Qassem Soleimani.

Who was Qassem Soleimani?

Soleimani, who was a soldier during the 1980-88 Iran-Iraq war, became commander of the Quds Force, the foreign operational wing of the IRGC, in 1998. Always a defender of the Islamic Revolution, Soleimani was instrumental in shaping Iran's forward defence doctrine, which sought to build regional strength through a network of Shia militia groups across West Asia. Iran helped create Hezbollah, a Lebanese Shia movement, in the 1980s and it continued to nurture good ties with Iraqi Shia organisations throughout the regime of Saddam Hussein. In recent years, Iran built stronger ties with Yemen's Shia rebels Houthis, as well as Hamas and the Islamic Jihad, Palestinian Sunni militant groups that are fighting Israel's occupation of Palestinian territories.

Soleimani, as the head of the IRGC's foreign operations wing, left a deep imprint on Iran's ties with these groups over the years. This relationship came handy for him to stitch together an anti-IS coalition when Iraq and Syria fell into chaos in the 2010s. The U.S. helped the Shia coalition fight the IS in Iraq, but it also accused Soleimani of supporting terrorism, given his close ties with foreign Shia militias. Inside Iran, he enjoyed cult status. Ayatollah Ali Khamenei, the Supreme Leader of Iran as well as the commander of Iran's armed forces, once called him "the living martyr of revolution". On January 3, 2020, a U.S. air strike in Baghdad, ordered by President Donald Trump, assassinated Soleimani, the primary enemy of the IS. And on the fourth anniversary of his assassination, the IS attacked a memorial event that took place near his qabar in Kerman.

Relevance: GS Prelims & Mains Paper II; International Relations
Source: The Indian Express