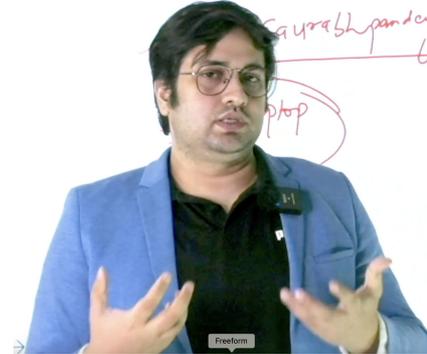


# Topics - MINDS MAPS included

- Promoter and Enhancer
- Derivatives
- Power sector /energy demand
- Atomic clocks
- Minerals in Congo
- Lashio
- Mains



By saurabh Pandey



**Target Mains -2024/25 -**

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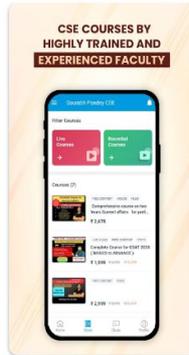
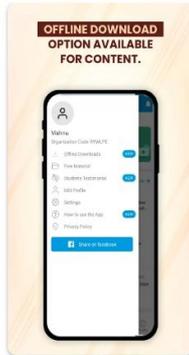
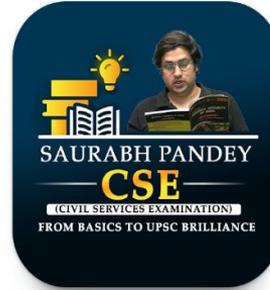
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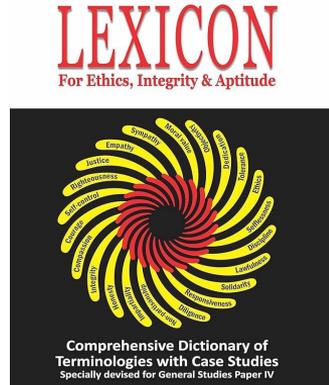
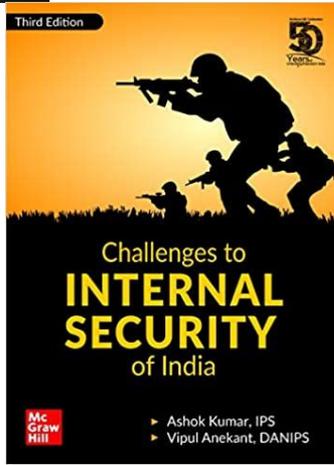
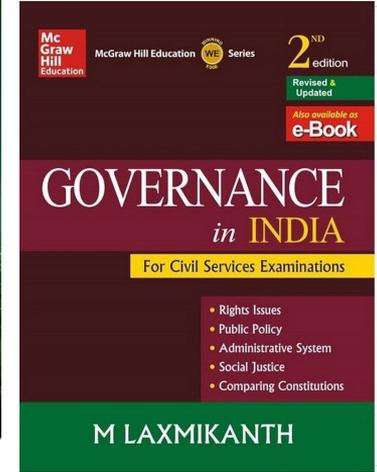
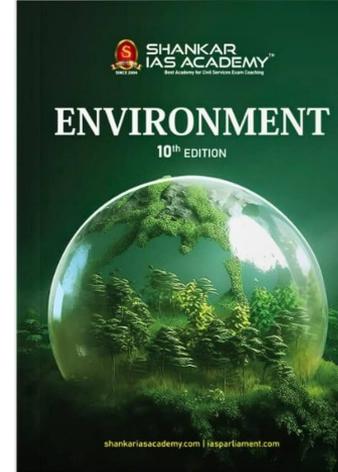
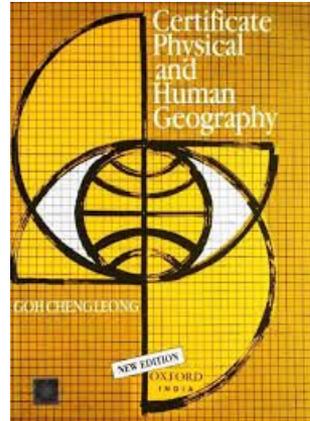
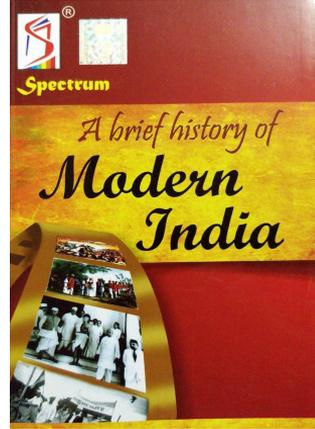
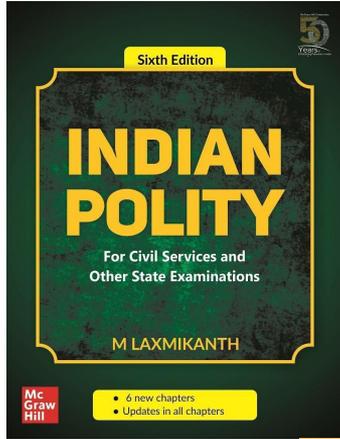
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# Topic- Promoter and Enhancer

- **A gene is a stretch of a few thousand base-pairs.**
- **A cell 'reads' this sequence as an instruction to make a specific protein.**
- **Next to the protein-coding sequence is another sequence called the promoter.**
- **The promoter allows the cell to express the relevant gene.**
- **Other sequences called enhancers, located tens to thousands of base-pairs away from the gene, influence the activity of nearby promoters.**
- **These promoter-enhancer interactions influence gene expression in different types of cells.**

# Topic- Derivatives

- **Derivatives are financial instruments that derive their value from an underlying asset or group of assets.**
- **The underlying asset can be stocks, bonds, commodities, currencies, interest rates, or even market indices.**
- **Derivatives are used for a variety of purposes, including hedging against price movements, speculating on future price movements, and providing leverage.**

## There are several types of derivatives, including:

- **Futures Contracts:** A legal agreement to buy or sell a particular commodity or financial instrument at a predetermined price at a specified time in the future.
- **Options:** Contracts that give the buyer the right, but not the obligation, to buy (call option) or sell (put option) an asset at a specified price within a certain period.

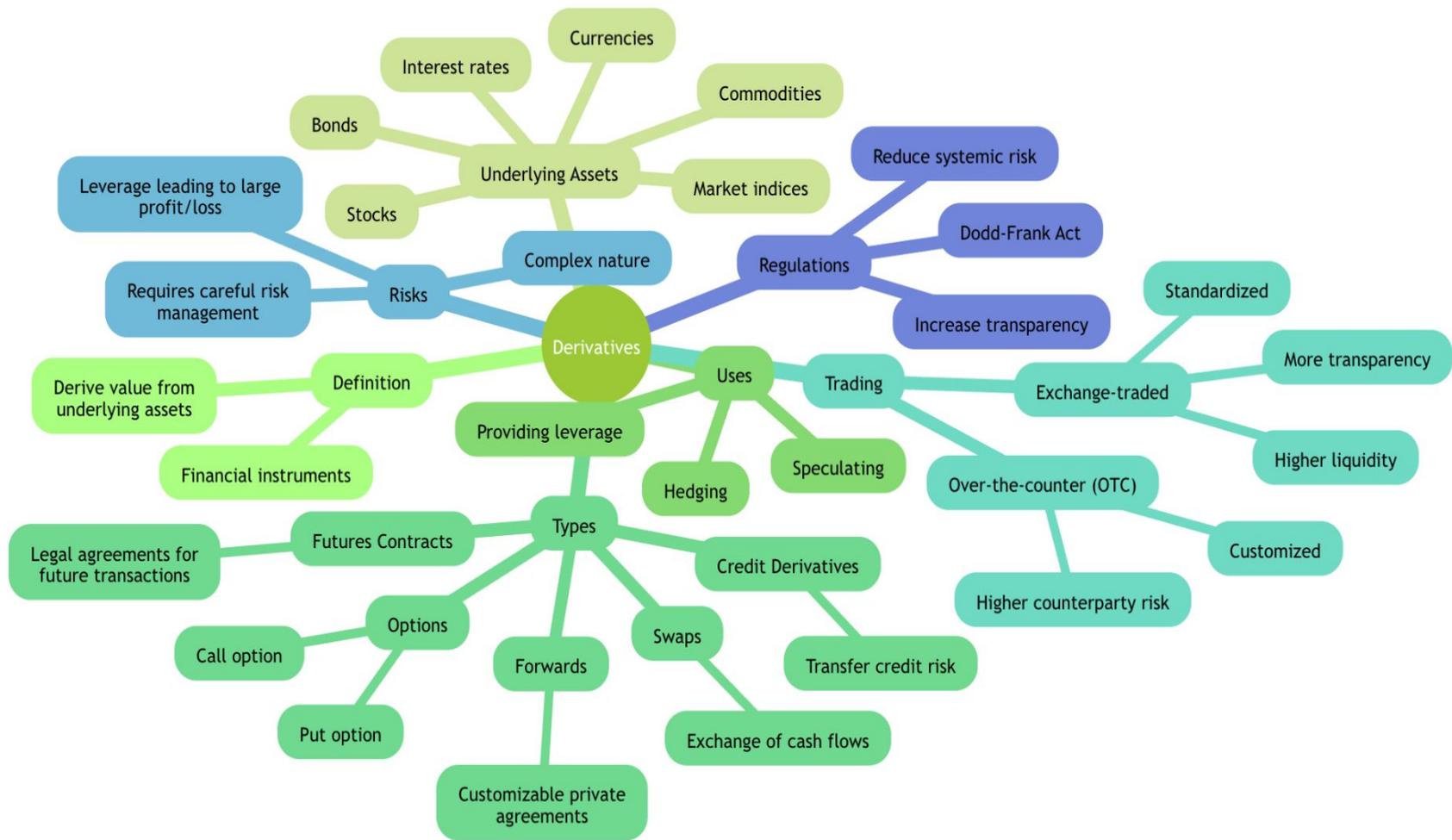
**Swaps:** Contracts in which two parties exchange cash flows or assets for a certain period. Common types include interest rate swaps and currency swaps.

**Forwards:** Similar to futures contracts, but they are customizable private agreements between two parties, not traded on an exchange.

**Credit Derivatives:** Instruments designed to transfer credit risk, such as credit default swaps (CDS).

- **Derivatives can be traded on exchanges or over-the-counter (OTC). Exchange-traded derivatives are standardized and offer more transparency and liquidity, while OTC derivatives are customized and can carry higher counterparty risk.**
- **Derivatives are complex financial instruments and can be risky, especially when used for speculation.**
- **They are often leveraged, meaning that a small movement in the price of the underlying asset can lead to a large profit or loss for the derivative holder.**

- **As a result, derivatives trading requires careful risk management.**
- **Regulatory frameworks have been established to oversee the derivatives market, such as the Dodd-Frank Act in the United States, which was enacted in response to the financial crisis of 2007-2008 to increase transparency and reduce systemic risk.**



# **Topic- Power sector /energy demand**

**three key milestones India has achieved in the last decade.**

**First, near-universal electrification through the Saubhagya scheme, with independent surveys by the Council on Energy, Environment, and Water (CEEW) suggesting that approximately 97% of households were electrified in 2020.**

**Second, the country saw a five-fold increase in installed renewable energy (RE) capacity, making India the fourth-largest country globally by RE capacity.**

**Third, there was a 40% drop in aggregate losses of power distribution companies (discoms), to an all-time low of about 15% in 2022-23.**

- **Our annual electricity demand has been growing by 7-9% every year since the COVID-19 pandemic, But our peak demand is rising even faster.**
- **Climate change-induced weather extremes further exacerbate these challenges.**
- **For discoms, meeting unplanned surges through affordable options and existing network capacity is challenging, resulting in power outages.**

## **Steps**

**First, the government must raise targets for renewable energy and storage systems to go beyond 500 GW in 2030.**

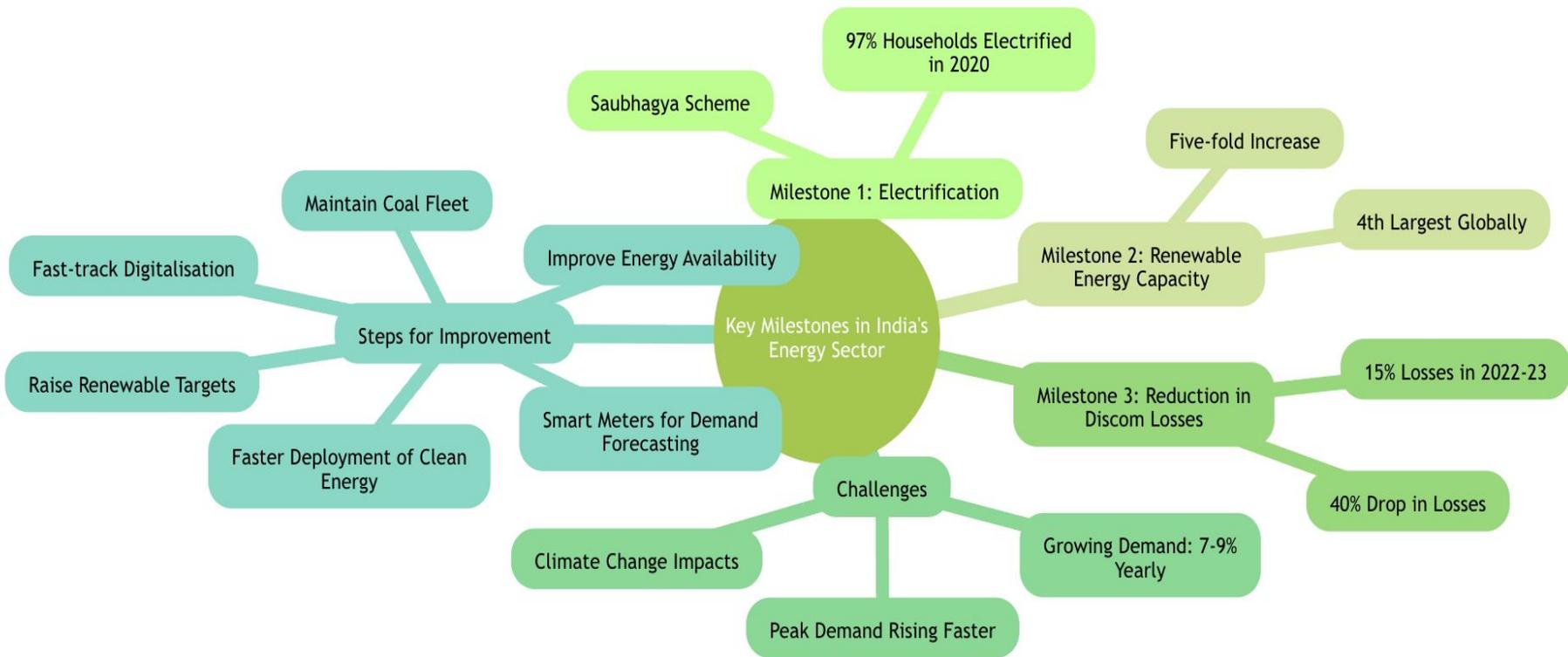
**Second, steer faster deployment of diverse clean energy resources.**

**Third, implement measures to improve the availability of energy.**

**Fourth, ensure effective maintenance and utilisation of the coal fleet.**

**Finally, fast-track digitalisation to empower discoms and consumers to play an active role in India's energy transition.**

**Smart meters would enable discoms to forecast power demand accurately, plan networks better, and integrate renewables cost-effectively**



Key Milestones in India's Energy Sector

Steps for Improvement

Fast-track Digitalisation

Maintain Coal Fleet

Raise Renewable Targets

Faster Deployment of Clean Energy

Improve Energy Availability

Smart Meters for Demand Forecasting

Challenges

Climate Change Impacts

Peak Demand Rising Faster

Growing Demand: 7-9% Yearly

Milestone 1: Electrification

Saubhagya Scheme

97% Households Electrified in 2020

Milestone 2: Renewable Energy Capacity

Five-fold Increase

4th Largest Globally

Milestone 3: Reduction in Discom Losses

15% Losses in 2022-23

40% Drop in Losses

## **Topic- What are laboratory chemicals?**

- **Imported chemicals, reagents, and enzymes come under the category of laboratory chemicals and are vital to experimental research across nearly every domain of scientific research.**
- **They comprise oxidisers, corrosive acids, and compressed gas, that are used by researchers to conduct experiments and even make new products.**
- **Outside of research settings, the medical diagnostics industry is run on laboratory chemicals.**
- **Closely affiliated to these chemicals are laboratory instruments such as funnels, beakers, test tubes and burners.**

- **Because these chemical compounds have a wide range of properties and are potentially hazardous, they are regulated and their imports scrutinised.**
- **Most of such chemicals are niche products and can be fairly expensive.**
- **The Customs Department defines laboratory chemicals as “all chemicals, organic or inorganic, whether or not chemically defined, imported in packings not exceeding 500 gms or 500 millilitres and which can be identified with reference to the purity, markings or other features to show them to be meant for use solely as laboratory chemicals**

- **The Budget documents released on July 23, silently hiked the Basic Customs Duty (BCD) on these chemicals to 150% from the existing 10%.**
- **The customs department did this as it wanted to reign in imports of ethanol that were being brought in as ‘laboratory chemicals’.**
- **The Finance Ministry has now withdrawn the customs duty hike on imported laboratory chemicals**

# Topic- Atomic clocks



- **Atomic clocks are incredibly precise timekeeping devices that measure time by monitoring the natural vibrations of atoms, typically cesium-133.**
- **These clocks are the most accurate time and frequency standards known, and they are used to define the second, the base unit of time in the International System of Units (SI).**
- **The principle behind atomic clocks is based on the quantum mechanical property of atoms that allows them to absorb and emit electromagnetic radiation at very specific frequencies.**
- **This phenomenon is used to stabilize the frequency of an electronic oscillator, which is then used to measure time.**

Here's a simplified explanation of how an atomic clock works:

- **Atomic Transition:** Atoms of a particular element (e.g., cesium-133) are excited by electromagnetic radiation at a specific frequency. This causes the electrons of the atoms to transition between two energy levels.
- **Microwave Cavity:** The atoms are held in a microwave cavity where they are bombarded with microwave radiation. The frequency of this radiation is precisely controlled and tuned to the exact frequency at which the atoms transition between energy levels.

- **Feedback Loop:** The microwave frequency is adjusted until a maximum number of atoms are detected in the higher energy state. This frequency is then locked in and used as the reference frequency for the clock.
- **Time Measurement:** The locked frequency is used to control an electronic oscillator, which generates a highly stable frequency. This frequency is then divided down to produce a one-second pulse, which can be used to display time.

**Atomic clocks are critical for various applications that require precise timekeeping, including:**

- **Global Navigation Satellite Systems (GNSS), such as GPS, GLONASS, Galileo, and BeiDou, which rely on atomic clocks to provide accurate positioning, navigation, and timing services.**
- **Telecommunications networks, which use atomic clocks to synchronize data transmission.**
- **Scientific research, including physics, astronomy, and metrology.**
- **International time distribution, where atomic clocks are used to define Coordinated Universal Time (UTC).**

- **The accuracy of atomic clocks is typically measured in terms of fractional frequency error, and they can achieve uncertainties of less than a second in billions of years.**
- **Advances in atomic clock technology are ongoing, with researchers exploring new types of atomic clocks, such as optical atomic clocks, which operate at higher frequencies and promise even greater precision.**

# Topic- Minerals in Congo

- The Democratic Republic of Congo (DRC), often referred to simply as Congo, is one of the world's richest countries in terms of mineral resources.
- It is home to a vast array of minerals that are crucial for various industries, including electronics, construction, and energy. Some of the key minerals found in Congo include:

**Cobalt:** Congo is the world's leading producer of cobalt, which is essential for the manufacturing of rechargeable batteries used in smartphones, laptops, and electric vehicles.

- **Coltan (Columbite-tantalite):** This mineral is a source of tantalum, which is used in the production of capacitors for electronic devices, making it a critical component in many modern technologies.
- **Copper:** Congo is also a significant producer of copper, which is widely used in electrical wiring and various industrial applications.

**Diamonds:** The country is known for its diamond production, and diamonds from Congo have played a significant role in the global gemstone market.

**Gold:** Congo produces gold, which is used not only in jewelry but also in electronics and as a store of value in the financial markets.

**Tin:** The country has deposits of tin, which is used in soldering, plating, and the production of alloys.

**Manganese:** Congo is a major producer of manganese, which is vital for steel production and has other industrial uses.

- **Despite its wealth of mineral resources, Congo faces challenges in effectively managing and benefiting from these resources.**
- **Issues such as corruption, conflict, and poor governance have historically hindered the development of the mining sector and the broader economy. Efforts to improve transparency and ensure that the revenues from mineral extraction benefit the Congolese people are ongoing.**

- **The international community has also been involved in initiatives aimed at improving the governance of mineral resources in Congo, such as the Kimberley Process Certification Scheme for rough diamonds and the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.**
- **These initiatives seek to prevent the trade of conflict minerals and promote responsible mining practices**

# Topic-Lashio

- **Lashio is a city located in the Shan State of Myanmar (formerly known as Burma).**
- **It is an important transport hub, situated on the main road and rail routes between Myanmar's largest city, Yangon, and the Chinese border. Lashio is also known for its role in the history of World War II, particularly as a base for Allied forces during the conflict.**
- **During World War II, Lashio was a key location due to its proximity to the Burma Road, a vital supply route between China and the outside world.**

- **The road was crucial for transporting supplies and equipment to support the Chinese resistance against Japanese forces.**
- **The Japanese invasion of Burma in 1942 led to the capture of Lashio, which effectively cut off the supply route and had significant strategic implications for the war effort in the region.**

## Why in news ??

- **Myanmar's military regime acknowledged on Monday it had lost communications with the commanders of a strategically important Army headquarters in the northeast.**
- **The fall of the Army's Northeast Command in Lashio would be a significant blow to Myanmar's military government this year as an offensive launched by an alliance of powerful militias of ethnic minority groups continues to make broad gains in the country's civil war**

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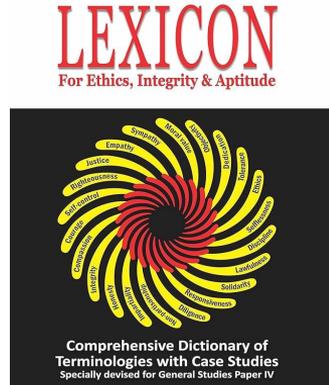
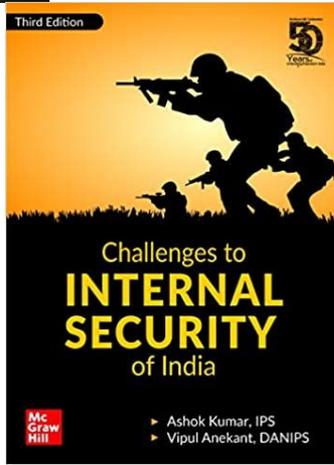
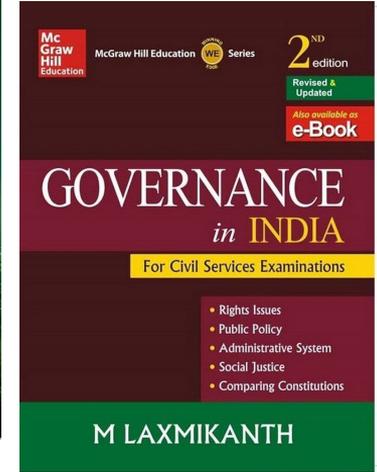
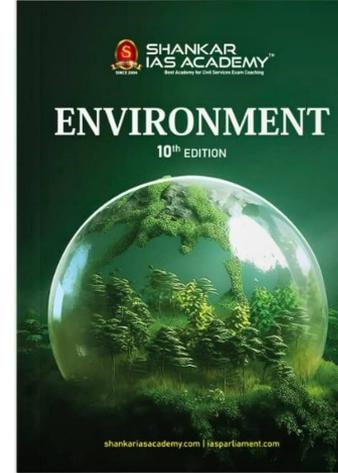
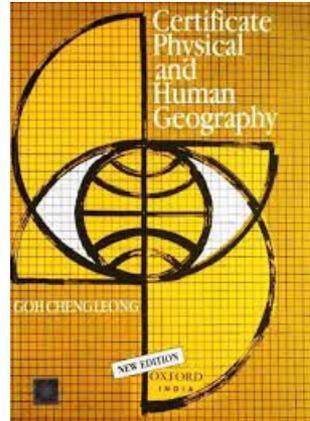
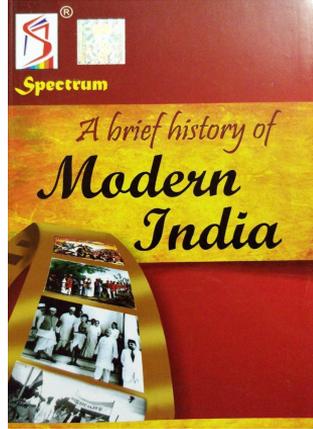
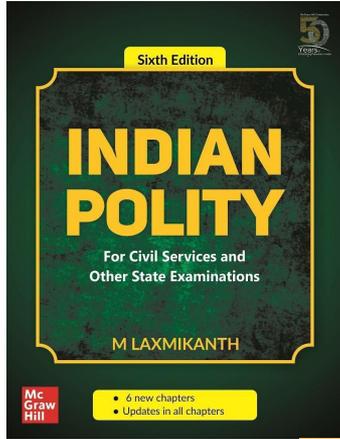
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