APPROACH – ANSWER: G. S. MAINS MOCK TEST - 1419 (2020)

1. Highlighting the issues associated with power discoms in India, discuss whether privatizing discoms can help in this regard. (150 words) 10

Approach:

- Highlight the state of power generation in India.
- Write about various issues being faced by power discoms in India.
- Present arguments how privatizing discoms can help address these issues.
- Conclude with a way forward.

Answer:

India became the third largest electricity generator in the world with installed capacity of power generation reaching 344 GW in 2018. Further, power generation witnessed a compounded annual growth rate of 8.9% between 2006 and 2018.

However, the discoms i.e. power distribution companies, continue to be faced with following issues:

- **Operational inefficiencies** due to huge technical and commercial losses (AT&C) at 21.4% which are primarily caused by power theft, poor payment collection procedures, and inadequate tariff hikes.
- **Increasing open access transactions:** Big commercial customers who pay higher tariffs are engaging in private power purchase through open access i.e. directly buying from the suppliers bypassing discoms.
- **Lack of political will and transparency** in dealing with phasing out of energy subsidies for the consumers.
- **Decline in demand during lockdown:** Revenue of discoms have fallen due to halt in commercial activities while domestic users pay lower tariffs.
- **Increased Power Purchase Cost:** After the one-time measures under UDAY, the power purchase costs have now increased by 5 per cent in the first nine months of 2018-19. Further the input costs of coal and freight have gone up.
- **Indebtedness:** According to the PRAAPTI portal, power producers' total outstanding dues owed by discoms rose over 47% year-on-year to Rs. 1.33 lakh crore in June 2020.
- **Financial incompetence:** DISCOMs have delayed payments owed to solar and wind energy developers making investments into the sector extremely challenging.

The Government launched various initiatives like UDAY aimed at reinvigorating discoms, but discoms losses have not been minimized. In this context, privatization of discoms is being seen as a measure to revitalize discoms due to following reasons-

- **Past experiences:** There are sufficient case studies when private players have been proved to run cash strapped discoms successfully via more efficiency, increased revenue and improved consumer services. For e.g. the AT&C losses in Delhi after the privatization in 2002 has been brought down from a high of 53% to around 8%.
- **Operational autonomy:** Due to improved network efficiency and lack of political interference.
- **Operational efficiencies:** Privatization will eliminate issues such as payment delays, power cuts, and lack of market-based electricity pricing and stimulate economic activity.
- **Generating private sector appetite:** Amongst Indian and international investors, various PPP models will be tested and it will also provide confidence to larger states and utilities to undertake privatisation based on improvements achieved.

However, privatization of discoms needs to be accompanied by other measures such as providing autonomy to regulatory bodies; cooperative federalism between centre and state; reinventing revenue model of discoms which should be conducive to the growth of rooftop solar and open access power.

2. Harnessing Smart Agriculture can potentially be a game-changer for farm productivity in India. Discuss. (150 words) 10

Approach:

- Define the concept of Smart Agriculture.
- Write about the potential of Smart Agriculture for increasing productivity in India.
- Conclude with a way forward.

Answer:

Smart Agriculture is an emerging concept that refers to managing farms using modern Information and Communication Technologies (ICTs) such as Internet of things (IoT), sensors, drones, AI, GPS etc. to **increase the quantity and quality of products** while optimizing the human labour required. The farmers in India, besides facing resource constraints, are not aware about modern farming techniques.

Smart Agriculture can help India improve its farm productivity due to following benefits that it offers:

- **Precision agriculture:** It makes the agricultural practices more precise and well-planned by including processes like real-time crop and soil condition monitoring, plant health tracking, and weather prediction. The farmers can administer their fields based on the insights obtained by this system.
- **Soil study**: Sensors will collect soil data which can be analysed to generate actionable messages for farmers besides helping in precision agriculture.
- **Estimation of water requirements of crops**: Crop water requirements depend on various conditions: crop types, season, climate, and growth stages of crops. ICT will help farmers make decisions on the amount of water their crops need in real time.
- **Disease detection and diagnosis**: Many crops get ruined due to lack of proper pesticide control mechanism. It can help in timely discovery of diseases by capturing images of plant leaves and analysing them through AI or transmitting them to remote libraries for detection.
- **Fertilizer optimization**: Applying fertilizer is an important farming activity with a potential to greatly affect farm productivity. It will help farmers taking decisions on which chemicals to apply and their crop-specific appropriate quantities.
- **Agricultural drones:** Since drones collect multispectral, thermal and visual imagery while flying, the data they gather provide farmers with insights into a whole array of metrics like canopy cover mapping, field water pond mapping, scouting reports, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on.
- **Tackling climate change**: Agriculture production is estimated to decrease by 10-20% by 2050 because of climate change. IoT based solutions can help cut GHG by precision farming and reducing agricultural wastage.

However, for India to take full benefit of smart agriculture, it is important that the supporting technologies and infrastructure along with skill training and increasing awareness of farmers are carried out in an effective and efficient manner. The focus should be on hands-on technology education to show farmers the real benefits of adopting technology. Technology-enabled Smart Agriculture will not only be producing more crops, but will generate Big Data, on which will run analytics to forecast yield as well as incorporate weather patterns into agricultural practices and completely transform this industry.

3. Rather than focusing solely on quantity, inclusive growth concerns itself with the quality of growth. Discuss. (150 words) 10

Approach:

- Brief highlight the various quantitative measures of growth.
- Discuss why growth solely on quantity has been criticized.
- Mention the advantages of inclusive growth, which focuses not just on quantity but also the quality of growth.
- Conclude on the basis of above points.

Answer:

Usually growth is measured in quantitative terms using various indicators such as Gross Domestic Product, National Income, Per Capita Income etc. However, focusing solely on quantitative growth has been criticized due to following reasons:

- Short-term growth strategies aimed at maximizing GDP growth has created a "**vicious cycle**" - growth driven by the exploitation of human and natural capital.
    - India has witnessed **jobless growth** with high levels of unemployment. Since 2000, India's GDP growth was second only to China, but the labour force participation rate shrank from 55% in 2012 to 49.7% in 2018.
    - India also needs considerable improvement in **several social indicators** as it was still ranked 129 among 189 countries in the 2019 Human Development Index.
- Lack of focus on distribution of growth **creates Inequality** which poses a threat to economic expansion and social cohesion around the world. For instance, the Oxfam report highlights that since 2000, the poorest half of the world population has received just 1% of the total increase in global wealth, while the 50% increase has gone to the top 1% only.

In this context, the concept of inclusive growth holds prominence. OECD defines **inclusive growth as the economic growth that is distributed fairly across society and creates opportunities for all.** This expands the focus from quantitative growth (GDP) to the qualitative aspect as well. **Following are the advantages of inclusive growth focused on the quality of growth:**

- The inclusive growth approach takes a **longer-term perspective** and addresses the structural and fundamental problems in society and the economy.
- When growth is 'inclusive' and "pro-poor", the incomes of poor people grow faster than those of the population as a whole, i.e., **inequality declines.**
- It leads to a **wider distribution of wealth** which creates a demand in a country and hence leads to domestic demand-driven growth. It **creates a strength in the economy** to withstand shocks and growth becomes sustainable in the longer run.
- With **better wealth distribution,** the overall standard of living increases. For example - people move away from polluting sources of energy such as wood, cow dung etc. and adopt more environment-friendly sources such as LPG which further improves environmental sustainability.

The inclusiveness and sustainability are interwoven in the concept of inclusive growth. As detailed in the World Bank's Poverty and Shared Prosperity 2016, the growth strategy should be geared towards creating opportunities for the least well-off people and preparing them for participating in their country's growth process and achieving sustainable development.

4. In the backdrop of Atmanirbhar Bharat, discuss the core areas crucial in export promotion for India to become a manufacturing hub. (150 words) 10

Approach:

- Briefly explain what you understand by Atmanirbhar Bharat.
- Discuss the areas that are crucial in export promotion for India to become a manufacturing hub.
- Conclude on the basis of the above points.

Answer

The 'Atmanirbhar Bharat' mission focuses on self-reliance in all sectors and envisions creating a production system that encourages local capacity building and indigenisation. It aims to make India a global manufacturing hub and promote export in core areas, such as:

- **Apparel, leather and footwear:** These sectors provide opportunities for large-scale labour absorption and export growth and require low skill and less capital investment. Further, with China losing share in the global market for exports in these sectors due to rising production costs, it is an opportune time for India to step in.
- **Electronics:** The electronics production growth increased fivefold from 2015 to 2018. This is mainly due to China losing its competitive advantage and creation of an ecosystem by the government to give a critical push to the sector. In this context, the focus should also be on integrating 'Assemble in India' with 'Make in India' to encourage assembling of products such as mobile phones, ventilators, micro digital items etc.
- **Pharmaceuticals:** India contributes over 20% by value to the global pharmaceutical generics market. Further, the industry is worth approximately $37 billion, with exports accounting for about $18 billion. The prices of medicines in India are amongst the lowest in the world, which gives it a competitive edge. In addition, the ongoing COVID-19 pandemic has given a push to the sector in terms of supplying generic medicine and being the potential epicenter of vaccine manufacturing.
- **Defence:** India has witnessed 700% growth in defence exports from 2016-17 to 2018-19 and it ranked 19th in the list of defence exporters in 2019. Going forward, to become a global manufacturing hub for defence equipment, India has to evolve an investor-friendly defence manufacturing policy and streamline procurement procedures.
- **Toys:** India's toy industry makes less than 1% of the world market. However, the industry has huge potential to be a major employment generator, as it is highly labour-intensive. Further, India already has numerous traditional toy manufacturing hubs like Channapatna in Karnataka, Kondapalli in Andhra Pradesh, Budni-Rewa in Madhya Pradesh etc., which can be incentivised for production-linked exports.
- **Solar industry:** India has the opportunity to become a global manufacturing hub in Solar Photovoltaic (PV) across the entire value chain due to its large market, expansion of solar generation capacity and several government initiatives introduced to give an impetus to the sector such as the National Solar Mission.

Despite the potential in the above-mentioned sectors, India faces several bottlenecks such as dependence on China for raw materials like Active Pharmaceutical Ingredients and solar panels, excess labour regulations, high logistics cost, complex taxation system etc. These challenges if adequately addressed can propel the Indian manufacturing sector to become a $1 trillion industry by 2025.

5. Arsenic pollution is becoming a severe environmental issue in India. Enumerating its various sources, discuss the consequences and measures to tackle it. (150 words) 10

Approach:

- Highlight the magnitude of the issue of arsenic pollution in India.
- Enumerate the sources of arsenic contamination and discuss its consequences.
- List the methods to tackle arsenic pollution.
- Conclude accordingly.

Answer:

Central Ground Water Board in a recent report highlighted that 21 states have pockets with arsenic levels higher than the Bureau of Indian Standards' (BIS) stipulated permissible limit of 0.01 milligram per litre (mg/l) and states along the Ganga-Brahmaputra-Meghna (GBM) river basin such as UP, Bihar, Jharkhand, West Bengal and Assam are the worst affected. Further, despite arsenic contaminating the food chain, mitigation measures are targeted towards groundwater or surface water. Also, arsenic contamination testing has been restricted to drinking water sources excluding water sources used for irrigation.

Arsenic is introduced into soil and groundwater through various sources, such as:

- **During natural processes** like weathering of rocks and minerals followed by subsequent leaching and runoff. It is also widely distributed throughout the air, water and land and is highly toxic in its inorganic form.
- **From anthropogenic activities** like intense exploitation of groundwater, application of fertilizers, burning of coal and leaching of metals from coal-ash tailings. It is also used as an alloying agent and in the processing of glass, pigments, textiles, paper etc.

Arsenic contamination has far-reaching consequences including:

- **Drinking arsenic water results in** cancer of skin, bladder, kidney and lung, diseases of the blood vessels and reproductive disorders.
- **Intense groundwater irrigation leads to uptake of Arsenic by the crops** causing photo-accumulation of arsenic in them. Thus, Arsenic enters the food chain. For example, paddy farms are exposed to Arsenic pollution. Also, when leaves are sprayed with such water, it may lead to bio-accumulation.
- The entry of arsenic into the food chain, in addition to drinking water increases possibilities of **biomagnification**.
- Rice husk used as **fodder for livestock exposes them to impacts of arsenic contamination**. This leads to potential risk for humans when they consume cattle-based food products.
- The presence of arsenic in food crops means that **spread of arsenic is much wider** and beyond the areas where they are grown such as the GBM river basin.

The measures to combat arsenic poisoning are:

- Treatment technologies based on **lime softening and iron co-precipitation** are deemed to be effective to tackle arsenic contamination.
- Innovative technologies, such as **permeable reactive barriers**, **phytoremediation**, **biological treatment and electro kinetic treatment** can also be used to treat contaminated water and soil.
- **Rainwater harvesting and recharging of groundwater table should be diligently practiced** to avoid fall in groundwater level and check leaching of metals into groundwater.
- **Substitution of high-arsenic sources**, such as groundwater, **with low-arsenic safe sources** such as rainwater and treated surface water.

The extent and severity of arsenic contamination should be recognised and necessary steps should be taken to combat it. Further, the government should develop a national plan of action and ensure that mitigation measures are implemented in a coordinated manner. It should also work with academic and research institutions to improve the understanding of the causes, extent and impact of arsenic contamination.

6. The Green Term Ahead Market (GTAM) can invigorate the renewable energy sector in India. Evaluate. (150 words) 10

Approach:

- Briefly, write about Indian renewable energy sector and the Green Term Ahead Market (GTAM).
- Highlight the potential of the GTAM to give push to the renewable energy sector in India.
- Conclude the answer accordingly.

Answer:

The renewable energy (RE) sector in India has not witnessed expected growth and one of the major factors responsible is the inflexible tariff structure. To overcome this, the government has recently launched Green Term Ahead Market (GTAM), which is an exclusive platform for short-term trading of renewable energy.

It has been introduced for selling of power by renewable developers in the open market without getting into long term Power Purchase Agreements (PPA). GTAM is expected to bring the following benefits to the RE sector:

- It would **lessen the burden** on renewable energy rich states by providing them a bigger market and will further incentivise them to develop capacity beyond their own Renewable Purchase Obligations (RPOs).
- It would **promote RE merchant capacity addition** and develop a trading market in RE which will also help incentivize installation of new RE projects.
- Along with the recently launched real-time trading in electricity, it will **support seamless integration of the RE sector by bringing buyers and sellers** across different states on a single platform**.**
- It would enable discoms, open access consumers and captive power producers to fulfill their **obligations to procure renewable power at competitive prices** as per their respective RPOs.
- It would lead to an increase **in the number of participants in the RE sector** like buyers through competitive prices, transparent and flexible procurement and sellers by providing access to the pan- India market.
- It would also provide a **platform to environmentally conscious consumers to use open access** to purchase green power.

The Government of India's target of 175 GW RE Capacity by 2022 and commitment under the Paris Agreement 2016 to install 40 per cent i.e. 450 GW of renewable capacity by the year 2030 is driving accelerated renewable penetration pan-India. Considering the above benefits, it can be said that the GTAM will help achieve the target by creating a short-term liquid market yielding increased prices for the RE sector.

7. In context of the increasing importance of technology for disaster management, throw some light on the application of GIS and Remote Sensing in disaster management with specific examples from India. (150 words) 10

Approach:

- Write a short introduction on the technology of GIS and remote sensing.
- Discuss the application of the two on disaster management.
- Quoting examples from the Indian experience, conclude briefly.

Answer:

With the recent advancements in technology, Geographic Information System (GIS) technology and Remote Sensing technologies have effectively improved the workflow in all phases of disaster management and provided effective remedial solutions. For instance, data from **Cartosat-1** was used for inundation vulnerability assessment of the Indian coastline in the event of a Tsunami; similarly **RISAT series** of satellites have previously been used towards disaster management and planning.

These technologies can be leveraged across all stages of disaster management:

Mitigation: Mitigation efforts attempt to prevent hazards from developing into disasters altogether or reduce the effects of disasters when they occur.

- GIS and remote sensing technology provides the capability to map and analyze hazards and visualize their potential impacts.
- When hazards are fused with critical infrastructure, population densities, and other community values, vulnerabilities can be observed, modelled, and better understood.

Preparedness: Emergency management requires development of plans of action for when disaster strikes. GIS and remote sensing technology can be utilized for preparedness as follows:

- Site selection for adequate evacuation shelters.
- Selecting and modelling evacuation routes.
- Identification and mapping of key tactical and strategic facilities like Hospitals, Public safety facilities etc.
- Providing capability for the command and control information system that enables situational awareness and incident management support.

Response: GIS and remote sensing supports the response mission as follows:

- Provide warnings and notifications to the public and others about pending, existing, or unfolding emergencies based on the location or areas to be impacted by the incident.
- Maintain continuity of operations supply inventories, external power requirements, shelter population capacities, etc. at shelter locations.
- Identify the locations and capabilities of existing and mutual aid public safety resources.
- Provide the capability to create remote connections to the command center for officials and others who need to participate but are unable to come to the command center.
- Establish the capability to share information and status with regional, state, and federal agencies.
- Maintain incident status and progress reports; facilitate damage assessment collection and analysis.

Recovery: The aim of the recovery phase is to restore the affected area to its original state. GIS and remote sensing can be integral for recovery through:

- Identification of damage.
- Overall damage costs and priorities for reconstruction efforts based on appropriate local criteria.
- Locations of business and supplies necessary to support reconstruction.
- Determination of short term action for assessing overall critical infrastructure damage like First aid and health; Additional shelter needs; Optimum locations for public assistance; Alternate locations for government operations if government facilities are damaged etc.

In addition, GIS data and remote sensing technology solutions are relatively cheaper and dependable. Hence, these technologies must be leveraged to generate an effective strategy to address all phases of disaster management in India and prevent economic and social losses.

8. The CRISPR/Cas9 genetic scissors have revolutionized the genome editing technique with applications in various areas. Discuss. (150 words) 10

Approach:

- Introduce by explaining the meaning of genome editing and CRISPR- Cas9 genome editing technique.
- Explain in brief how CRISPR- Cas9 has revolutionized the genome editing technique.
- Highlight its application in various areas.
- Conclude by mentioning the challenges and way forward.

Answer:

Genome editing or gene editing is a group of technologies, which allows genetic material to be added, removed, or altered at particular locations in the genome. CRISPR - Cas9 is the most prominent genome editing technique.

- CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats, which are specialized stretches of DNA.
- The protein Cas9 is an enzyme that acts like a pair of molecular scissors, capable of cutting strands of DNA.

The CRISPR-Cas9 system has revolutionized the gene editing techniques because:

- It is **cheaper, simpler, more accurate and efficient** than other existing genome editing methods such as Zinc finger nuclease-based engineering, Mega nuclease-based engineering etc.
- CRISPR/Cas9 can be applied directly in embryo, which **reduces the time required to modify target genes** compared to gene targeting technologies based on the use of embryonic stem (ES) cells.

CRISPR-Cas9 genome editing technique has application in numerous areas. It can potentially eliminate genetic, and other, diseases, multiply agricultural production, correct deformities, and bring cosmetic perfection. In effect, anything that is linked with functioning of the genes can be corrected, or 'edited'. For example:

- **Public Health:** There are clinical trials on CRISPR's use for blood disorders such as sickle cell disease or beta-thalassemia, for the treatment of the most common cause of inherited childhood blindness and for cancer immunotherapy. It can also be used for therapeutic cloning whereby embryonic cells are cloned to obtain biological organs for transplantation.
- **Agriculture:** CRISPR also has great potential to create a large number of crop varieties with improved agronomic performance, which can be helpful to improve crop quality, yield, nutritional content, disease resistance, and herbicide resistance.
- **Livestock and Animal Rearing**: It can lead to better disease resistance, increased animal welfare and improved productive traits – animals producing more meat, milk or high-quality wool.

This CRISPR technology is a path-breaking technology, to alter genes in order to tackle a number of conventional and unconventional problems, especially in the health sector. However, experiments and tests to validate its use must be subjected to appropriate scrutiny by the regulators, and their use must be controlled to prevent commercial misuse. Thus, there is a need for broad and inclusive discussion on the regulation of such technologies – especially given their vast applications and potential.

9. Bring out the role played by Financial Action Task Force in tackling the menace of money laundering. (150 words) 10

Approach:

- Give a brief description of the menace of money laundering.
- Briefly highlight about the Financial Action Task Force and its objectives.
- Write about the role played by FATF to tackle money laundering.
- Conclude appropriately.

Answer:

Money laundering is the process where a number of financial transactions are made to show money earned often from illegal/illicit routes to be as the proceeds of legitimate and legal businesses. It has close nexus with organized crime and terrorism. In response to the increasing concerns over money laundering, the Financial Action Task Force on money laundering (FATF) was established by the G-7 Summit in Paris in 1989 to develop a coordinated international response.

FATF is an intergovernmental body that acts as a **global money laundering and terrorist financing watchdog**. Comprising of 37-member countries (including India) and 2 regional organizations- **European Commission** and **Gulf Co-operation Council**, it seeks to achieve three objectives: combating money laundering; strengthening financial system; and international cooperation.

Role of FATF in combating money laundering:

- **Developing recommendations and providing support to member countries:** The FATF has come up with recommendations that are considered as the international standards for combating money laundering. It also provides support to countries and their financial institutions in designing anti money laundering measures.

- **Monitors the progress of members:** The FATF monitors the progress of its members in implementing necessary measures, reviews money laundering and terrorist financing techniques and counter-measures.
- **Identification of vulnerabilities:** In collaboration with other international stakeholders like the UN Office on Drugs and Crime, the FATF works to identify national-level vulnerabilities with the aim of protecting the international financial system from misuse.
- **Setting global standards to combat terrorist financing**: Since laundered money is used in terror financing, FATF ensures all its members countries have implemented measures to cut off terrorism-related financial flows according to its recommendations. All members are required to criminalise the financing of individual terrorists as well as terrorist organisations and freeze terrorist assets without delay and implement ongoing prohibitions.
- **Evaluating countries' ability to prevent, detect, investigate and prosecute the financing of terrorism**: FATF issues two lists namely- **Black list** (countries that subjected to economic sanctions and other prohibitive measures by FATF) and **Grey List** (countries that are subjected to increased monitoring by the FATF).
- **Identification of new risks:** Additionally, FATF continuously **strengthens its standards to address new risks,** such as the regulation of **virtual assets**, which have spread as cryptocurrencies gain popularity.

FATF, at present, is the most comprehensive mechanism to deal with money laundering which needs to be further strengthened by various measures such as- increasing cooperation that FATF should observe for information exchange among financial units and competent authorities and formulating a standard definition of fugitive economic offenders. Also, it can be empowered to conduct investigation exercises in the cases related to terror financing and money laundering.

10. Discuss the recent reforms that have been undertaken in the National Security Architecture of India. (150 words) 10

Approach:

- Introduce by giving brief information about the National Security Architecture of India.
- Highlight the recent reforms in it.
- Briefly conclude with measures still required to improve Indian's National Security Architecture.

Answer:

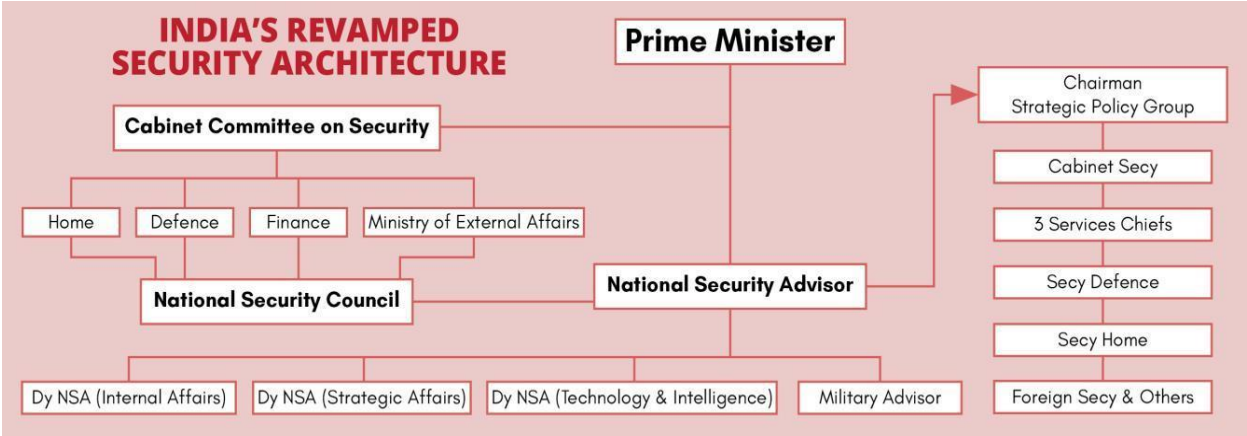
In 2017, the Prime Minister's Office (PMO) ordered the review of the national security structure, as it was felt there were too many silos in the system with no arrangement to take a comprehensive view on national security. Moreover, vulnerable security condition of India with its neighbors as well as transformation brought due to technology in recent years meant that there was a need to reform India's security architecture.

Given the above context, **following reforms have been made in India's National Security Architecture**:

- **Three deputy National Security Advisors** have been appointed instead of just one, while the post of military advisor has been revived. The three Deputy NSAs will widen the scope and responsibility of the National Security Council Secretariat (NSCS), which works directly under the National Security Adviser (NSA).
- A **Defence Planning Committee**, headed by the NSA, has been set up to align national security needs and defence resources into a singular decision-making agency.
- The government has formed **three tri-services agencies**— Defence Cyber Agency, the Defence Space Agency and the Special Operation Division - to create a join structure for cyber, space and special operations across the three armed forces and deal with new and emerging threats.
- The **Strategic Policy Group (SPG)** formed to assist the National Security Council (NSC) has been reconstituted with a National Security Advisor as its chief, with the Cabinet Secretary becoming its member. The NSA will have the power to co-opt any other official and department

as and when needed while the Cabinet Secretary will ensure coordination and implementation of decisions taken by the SPG.

- A **National Security Strategy document** is being envisioned, from which various agencies and the arms of the armed forces would draw their mandate and create their own respective and joint doctrines which would then translate into operational doctrines for tactical engagement.In the **National Security Advisory Board**, a diversity of domain expertise has been introduced to make it more responsive to the needs of the national security establishment.
- Appointment of **Chief of Defence Staff**, who will act as a principal military advisor to Defence Ministry on all tri-service matters and enhance synergy among the three services in dealing with security challenges facing India.



Moving forward, certain measures are required to further improve the security situation in India such as making NSA accountable to Parliament owing to the concentration of power in his hands and setting up NCTC for effective operationalisation of terror related intelligence inputs.

11. Bring out the key hurdles that are being faced in accomplishing land reforms in India. Also, discuss the advantages which can be reaped by accomplishing them in contemporary times. (250 words) 15

Approach:

- In introduction, briefly outline the objectives of land reforms.
- Analyse the hurdles faced in the accomplishment of land reforms, along with highlighting the failures of land reforms.
- Suggest why the cause of land reforms should be properly considered again.
- Conclude accordingly.

Answer:

Land reforms refer to policy changes relating to the issues of land ceiling and redistribution of surplus land, tenancy rights, alienation of tribal lands, modernisation of land management and national land use policy. The primary objective of land reforms is to ensure a **socially just** and **economically efficient** system of land ownership.

Challenges in accomplishment of land reforms:

- **Absence of updated land records:** Poor quality of land records due to outdated surveys, lack of uniform system for maintenance of records, incorrect entries, etc. have hindered land redistribution. Effective enforcement of land reforms requires **computerisation** and **modernisation** of land records.
- **Inconclusive ownership rights:** Since owners did not have **conclusive land rights**, this also prevented consolidation of landholdings.
- **Tenancy problems:** Tenancy laws provide little protection or land ownership rights to tenants, who are then subjected to arbitrary evictions by landowners.
- **Legal hurdles:** Laws related to land reforms are not uniform across states. Protracted litigation has delayed and often frustrated the implementation of land reform laws. For example, in most

states, **the limit on land ceiling** was kept very high and the redistributed surplus land was mostly infertile land.

- **Lack of political will:** Decision of the government on **State Agrarian Relations and the Unfinished Task of Land Reforms Report (2009)** is still pending. Enactment of progressive land reforms and efficient implementation call for effective political support and direction.
- **Compensation, rehabilitation and resettlement issues:** Lack of time bound rehabilitations and resettlement of communities affected by development projects, inadequate social impact assessments, forcible acquisition of land and unfair compensation have hindered the process of land reforms. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 aims to address these issues.
- **Inadequate administrative organisation:** Implementation of land reforms measures have been given lower priority by the revenue departments of the states.
- **Lack of financial support**: No separate allocation of funds was made in the five year plans for financing land reforms.

Land being the primary input in various sectors, accomplishing reforms in this respect would accrue multiple advantages in contemporary times as follows:

- **Increasing agricultural production and productivity**: It is argued that land reforms bring more land under cultivation and since tillers themselves would become the landowners, it would result in increased productivity and fuel the rural economy.
- **Reducing rural poverty and inequality:** Redistribution of only 5% of farmland in India, coupled with improved access to water, could reduce rural poverty levels by 30%. Ownership of land will motivate the farmers to work harder, invest more and thus create a ripple effect increasing the incomes and reducing the overall poverty.
- **Improvement of socio-economic status:** Land has been recognized as a primary source of wealth, social status, and power. There is a strong correlation in rural societies between the social status that a person enjoys and the quantity and quality of land rights held by that person.
- **Relative advantage of agriculture sector:** It is often argued that 1% increase in the agricultural GDP can create more equitable growth in rural India than many more fold increase in manufacturing or services sector. This growth can be effected through land reforms.

Land reforms were largely successful in the states of West Bengal and Kerala due to political will of state governments. It had a profound effect on the condition of peasants and the rural economy.

12. India needs to accord more significance to nutritional security than food security. Comment. In this context, suggest a framework that should be adopted by the government to achieve nutritional self-reliance. (250 words) 15

Approach:

- Write about why India needs to accord more significance to nutritional security.
- Suggest a framework that should be adopted by the government to achieve nutritional self-reliance.
- Give a brief conclusion.

Answer:

In India, the number of undernourished people declined from 253.9 million in 2004-06 to 194.4 million in 2016-18 which is still a large number. As of now, we seem to have solved the food security problem owing to the high production rates of some cereals such as rice and wheat. The current stock of rice and wheat is the highest that the Food Corporation of India has maintained since 2005. Thus, the focus should shift from food towards nutritional security, considering the following:

- **Persistence of undernutrition**: Despite historically high levels of food production in India, under-nutrition persists.
  - According to the Global Nutrition Report, 2020, 37.9% of children under 5 years of age are stunted and 20.8% are wasted.

    - Further, under-nutrition is also prevalent in adults with 22.5% being underweight and 38% being stunted.
- **Micronutrient deficiency:**
    - As per the National Family Health Survey, 58.6% of children, 53.2% of non-pregnant women and 50.4% of pregnant women were anaemic in 2016.
    - The National Nutrition Survey revealed that zinc deficiency was found among 19% of pre-school children and 32% of adolescents.
    - Further, prevalence of deficiencies of Vitamin B12, Vitamin A and Vitamin D hovered between 14% to 31% for pre-school children to adolescents.
- **Rising Obesity and prevalence of non-communicable diseases**: According to the 'Food and National Security Analysis, India, 2019', the energy and protein intake from cereals has decreased in both rural and urban India, largely because of increased consumption of other food items such as milk and dairy products, oils and fat and relatively unhealthy food such as fast food, processed food and sugary beverages. This has led to rising obesity among adults and children. It has also resulted in an increase in the burden of non-communicable diseases, wherein around 5.8 million people die per year in India due to such preventable deaths.

Without nutrition security, it is not possible to achieve an active and healthy life for all. Moving from food security to achieving nutritional self-reliance will require a different strategy. In this context, a framework on the following lines can be adopted by the government:

- **Nutrition dimension should be mainstreamed into national missions** like Food Security Act, National Health Mission etc., with defined input and output parameters for monitoring. Further, various schemes that tackle malnutrition can be dovetailed under one authority to achieve better outcomes.
- **Draw area production plans for animal husbandry and crop growth** to try and meet India's nutritional requirement considering agro-ecological zones and the changing climate.
- **Shift from incentivising production of few crops through MSP** to encouraging production of pulses, oilseeds, poultry products etc. as well. **Public distribution system should be further strengthened** and the basket of commodities should be increased to include millets, pulse and oils.
- **Increasing the quality of agricultural products** through increased expenditure on agriculture research, stringent enforcement of regulations, collaboration with the private sector and extensive use of digital technologies.
- **Raise fortified staples and micronutrient content in the food basket of the Mid-Day Meals.** Further, serving nutritious breakfast to elementary school students should be a part of the scheme, as envisioned by the National Education Policy 2020 on a priority basis.
- **Increase frequency of awareness campaigns** such as **'Eat Right India initiative'.** Further, unhealthy food and drinks should be highly taxed and advertisements should be discouraged.

The National Nutrition Mission and Integrated Child Development Services are important measures taken by the government in this context. These should be complemented by large-scale expansion of food fortification programmes, equitable food distribution, proper maternal, infant and childcare practices, maintenance of adequate hygiene and sanitation etc.

13. Private investments are key for India to move into a high growth trajectory. Discuss. Also highlight the steps taken by the government in recent times to address the fall in private investments. (250 words) 15

Approach:

- Briefly highlight the need of private investment for propelling India into a high growth trajectory.
- Discuss the ways in which private investment contribute in an economy.
- Enlist the various steps taken by the government in this regard.
- Conclude with a way forward.

Answer:

In order to create a **$5 trillion economy by 2024-2025**, **India needs to significantly enhance its capital expenditure.** However, public investment alone cannot fund the entire investment requirement of the country because of existing fiscal constraints and increasing expenditure on welfare activities. Thus, there is an urgent need to accelerate the flow of private capital into India.

This can be done by **encouraging greenfield investment** in sectors such as aviation, expansion of PPPs in highway projects, modernisation of railways etc. Indian **start-ups are also increasingly relying on the private sector for funding and expansion**. **Private investment is also crucial to enhance social and human capital.** This includes construction of schools, hospitals etc. in PPP mode, flow of private investment in R&D, skill development etc. In this context, the **focus should be on generating 'impact investments'**, which generate positive and measurable social and environmental impacts, along with financial returns. Further, to move into a high growth trajectory, **India needs to follow the path laid by countries such as the US, China etc**. and take necessary steps to make private capital investment conducive in the country.

However, despite its significance, **private investment has slumped in the last few years** leading to a slowdown in economic growth. When India grew at its fastest **(2003-08), private investment as a share of GDP was around 36%. In contrast, at present, it is hovering around the 29% mark.** This is due to abrupt stalling of infrastructure projects, increased global uncertainties, continued stress in India's domestic financial system, uncertain tax regime, arbitrary laws etc.

In this context, the **government has taken the following steps in recent times** to boost private investment:

- **Improvement in Ease of Doing Business** to attract private investment. In this context, steps have been taken to ease trading across borders by enabling post-clearance audits, integrate trade stakeholders in a single electronic platform, upgrade port infrastructures, and enhance electronic submission of documents etc.
- The **National Investment and Infrastructure Fund** has been created with a capital of approximately Rs.400 billion to provide investment opportunities to commercially viable projects. This will be a solution in the short-term with regard to sluggishness of private investments.
- The government has **cut down the corporate tax rate** to 22% from 30%. It also **lowered the tax rate for new manufacturing companies** to 15% to attract new foreign direct investments.
- To improve ease of compliance and ensure uniformity in labour laws, the government has brought a bill for the **consolidation of central labour laws** into four codes namely- Wages; Industrial Relations; Social Security; and Occupational Safety, Health and Working Conditions.
- PPP is being encouraged through the **New Education Policy 2020 as well as National Health Policy.** Several investment models such as HAM, BOT, EBC, etc. have been brought in the infrastructure sector.
- **Increased liberalisation of FDI regime** in diverse sectors such as defence, pharmaceuticals, retail, aviation etc. has been done. Effort to divest government holdings in state-owned corporations is another encouraging sign.

Further, speedy labour and land reforms, a predictable and stable taxation regime, facility for renegotiating PPP projects, speedier implementation of **National Infrastructure Pipeline** should be undertaken to build confidence among investors so as to attract private investments.

14. India's geographical diversity and varied levels of development across regions necessitate a targeted region specific action plan to ensure a minimum acceptable level of prosperity. Elaborate. (250 words) 15

Approach:

- Start with a short note on the diversity and regional imbalance in India.
- Establish the need for region specific action plans to counter the same.
- Suggest some measures that can be included in these plans.
- Conclude appropriately.

Answer:

India is a vast country having a wide geographic diversity with high mountains in the north, desert in the north-west region, vast stretch of plain areas along with wide coastline in the peninsular region. Further, variations of development across regions has also been observed:

- **Industrialization:** The Southern states lead the chart of the most industrialized states in the post reform period. In comparison, the overall growth rate was much lesser in Northeastern India.
- **Structural Issues:** Structurally, poor states bear many similarities, particularly a low industrial base, a low productivity agricultural and service sector, and poor health and education.
    - The performance of under-developed regions across indicators like fertility, sterilization, Family planning evolution etc. shows a disparity.
    - Similarly, HDI figures for Bihar are much lower vis-à-vis Kerala which bears significant correlation with regional development disparities.
- **State-wise per capita income**: The gap between the richer and poorer states has widened over the past two decades.

Given such a situation, this necessitates drafting region-specific action plans keeping in mind respective developmental needs. Although government has taken various initiatives such as **Integrated Action Plan (IAP)**, **Backward Region Grant Fund (BRGF)**, the **Border Area Development Programme** etc**.,** a lot more needs to be done targeting regions as per their specific requirements:

- **For North-Eastern India**
    - **Development of physical infrastructure** between the NER and neighbouring countries in terms of digital connectivity, distribution of power and transport links etc. must be prioritised.
    - **On-going transport connectivity projects** including the East West Corridor, Special Accelerated Road Development Project (SARDP-NE) and Trans Arunachal Highway should be accelerated.
    - The government should implement **Centrally Sponsored Schemes** for the development of special industries including sericulture, floriculture, tea plantations and the silk industry. Artisans and handicraft industry of the North East region should also be promoted.
- **For Coastal regions**
    - The island regions in Coastal India must be developed into **global tourist destinations**; create jobs for local communities and their sustainable development.
    - **Infrastructure projects** like Economic Corridors; creation of Coastal Employment Zones etc.
- **For Himalayan states and Hilly Regions**
    - Himalayan States should be **integrated with the global economy** to leverage the global interest in their handicraft industry and tourism in the region.
    - Research centres on developing and spreading the **use of technology/instruments/ materials agreeable to the hill economy** and ecology should be established.
    - **Alternative industries** like animal husbandry, fruit and timber plantation and floriculture among others where the region has a comparative advantage should be identified.
- **Desert and Drought Prone Areas**
    - New tourist circuits; alternative livelihood opportunities must be created. Access to basic amenities and provision of education must be accelerated.
- **Empowered action group states** (socioeconomically backward states)
    - Focus must be capacity on capacity-building so that issues related to implementation of various schemes can be resolved.
    - Awareness generation campaigns for family planning, augmentation of health-care facilities specially should also be prioritized.

It is imperative that a common set of national policies must be complemented by policies and programmes targeted at specific regions. This is reinforced by the fact that within democratic polity, growth and prosperity must exhibit regional balance.

15. Empowering the farmers by ensuring barrier-free trade in the agriculture produce is critical in doubling their incomes. Enumerating the existing bottlenecks, discuss how the recent legislations can help in overcoming them. (250 words) 15

Approach:

- State the bottlenecks faced by the Indian farmers during the course of trade of agricultural produce.
- Discuss how the recent legislations can help in overcoming them.
- Briefly mention the objections to the legislations and suggest remedial measures.
- Conclude with a way forward**.**

Answer:

Agricultural sector remains the primary source of livelihood for around 58% of the population and contributes around 16% to India's GVA, still it continues to face a number of bottlenecks in trading of its produce which include:

- **Unremunerative farming**: Farmers are increasingly facing indebtedness and stagnation due to exploitation by intermediaries, market unpredictability etc. Further, despite surplus production in most agri-commodities, farmers are unable to get better prices for their produce due to lack of investment in cold storage, processing and export.
- **Issues with Agricultural Produce Market Committees (APMCs):**
  - Most APMCs have a limited number of traders operating, which leads to cartelisation and reduces competition.
  - There are undue deductions in the APMCs such as commission charges and market fees.
  - The farmers face restrictions while selling their agri-produce outside the notified APMCs and have to sell only to registered traders.
- **Legal constraints:** Agricultural markets are over-strained due to outdated laws that were codified with a food scarcity mindset. For instance, the Essential Commodities Act, 1955 imposed curbs on stocking of farm produce.
- **Inter-state trade restrictions**: This is due to prevalence of multiple APMC regulations enacted by the state governments.

To overcome the existing limitations, the Central government recently brought three legislations, namely:

- **The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Act, 2020:**
  - It promotes barrier-free inter-state and intra-state trade and commerce outside the physical premises of APMC markets notified under state legislations. This will enable farm produce to move freely from surplus to deficit regions and advance the idea of 'one nation, one agri-market'.
  - It permits electronic trading of scheduled farmers' produce in the specified trade area, which will remove intermediaries.
  - It prohibits state governments from levying any market fee, cess or levy on farmers, traders, and electronic trading platforms for trade in an 'outside trade area'.
- **Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act, 2020:**
  - It gives a legal framework to contract farming through an agreement between a farmer and a buyer before the production or rearing of any farm produce.
  - Due to prior price determination, farmers will be shielded from the fall of market prices.
  - It provides an effective dispute resolution mechanism with stipulated timelines for redress.
- **The Essential Commodities (Amendment) Act, 2020:**
  - It amends the Essential Commodities Act, 1955 and provides that the central government can regulate the supply of certain food items only under extraordinary circumstances like war, famine, etc. It also removes arbitrary stock limitations on farm produce.
  - The freedom to produce, hold, move, distribute and supply will lead to harnessing economies of scale and attract the private sector/FDI into the agriculture sector. It will also lead to investment in cold storages and modernization of the food supply chain.

- It aims to remove fears of private investors of excessive regulatory interference in their business operations.

However, there is apprehension that the legislations will lead to dismantling of MSP regime and allow large corporations to control farm prices and reduce farmers' security net when the free market system is fully established and APMCs cease to exist due to inactivity. Therefore, all stakeholders including farmers, FPOs, corporates, central and state governments etc. should engage in discussions regarding the contentious provisions of the legislations and formulate mutually agreed solutions.

16. The reasons for recurring floods in the regions of Eastern India such as Bihar and Assam go far beyond their topography. Discuss. Also, suggest measures to control this menace.

(250 words) 15

Approach:

- Introduce with the magnitude of the recurring floods problem in Eastern Indian states of Bihar and Assam.
- Highlight the reasons for it.
- Mention the measures to control it as well.
- Conclude accordingly.

Answer:

About 40% of the total land area of Assam and 74% of the geographical area of North Bihar is considered to be prone to floods. The average annual loss due to flood in Assam is to the tune of Rs. 200 crores.

The **topographical factors** are the primary causes of the recurring floods in these regions. These factors determine the **overflowing of rivers** such as Brahmaputra, Barak, Kosi etc. in these regions, which is often aggravated by siltation, changes in river courses due to earthquakes and landslides, more inflow from neighbouring states/countries etc.

However, there are **other factors** far beyond topography, which result in recurring floods in Eastern India. It includes:

- **Meteorological factors**: 80% of the precipitation in India takes place in the monsoon months from June to September. Concentrated rainfalls in a short span of time and events such as cloud bursts often cause floods in Himalayan Rivers.
- **Anthropogenic factors**: These include deforestation, drainage congestion, encroachment of natural water bodies, unsustainable mining of river-bed, poorly planned development works and climate change induced extreme weather events.
- **Flaws in Flood management strategies**:
  - **Construction of embankments without proper assessment**: Embankments can interfere with drainage and cause drainage congestion. They can raise river bed levels thus decreasing the carrying capacity of rivers.
  - **Absence of an integrated approach by the Centre and the state**: The Brahamaputra Board formed under the Brahmaputra Board Act, 1980, lacks coordination with the state government. Similar lack of coordination can be seen between the Assam Disaster Management Authority and National Disaster Management Authority (NDMA).
  - **Unrealized potential of multipurpose dams**: The dams in Assam and Bihar mainly focus on the hydropower benefits and lack storage space for flood control.
  - **Transboundary management of rivers**: Absence of real time sharing of hydrological data and poor coordination among river basin nations about river flow management is an issue.

Measures to control it include:

- **Adopting a collaborative approach** involving all stakeholders — the Centre, the states, the district administration, Indian Meteorological Department and crucially, the community.
  - It is also important for Assam to work together with the neighbouring states like Meghalaya that share the basin of Brahmaputra.

- **Shifting the focus from unplanned construction of embankments to flood mitigation policies** that complement the existing embankments and mitigate the impact of floods.
- An **integrated approach to managing floods** is needed that works simultaneously for water management, physical planning, land use, agriculture, transport and urban development as well as nature conservation.
    - For e.g. wetlands, locally known as beels, act as reservoirs and rejuvenating them before monsoon can help in mitigating flood in certain parts.
- **Incorporating storage space in the reservoirs** as a preventive measure during the floods.
- **Raising awareness among communities** residing in the flood-prone areas and ensuring efficiency of the local authorities could help mitigate the effects of the disaster.
- **Improving Flood forecasting** so that information about floods forecasts reaches the affected villages on time.
- **Managing silt through dredging**. The fine dredged material can be used to supply organic content and nutrients to deficient soils to increase productivity.
- **Flood Plain Zoning (FPZ):** FPZ measures aim at demarcating zones or areas likely to be affected by floods of different magnitudes or frequencies and probability levels and specifying the types of permissible developments in these zones, so that whenever flood actually occurs, the damage can be mitigated.

Undertaking all these measures would require mobilisation of national political will, committing substantial national resources and seeing it through.

17. How can 5G technology potentially bring about a digital revolution in India? Identify the challenges in adoption of 5G technology in India. (250 words) 15

Approach:

- Introduce by writing the meaning of 5G technology.
- Discuss how it can bring about a digital revolution in India.
- Discuss the challenges associated with it.
- Conclude the answer.

Answer:

5G is a fifth-generation mobile network technology. It is designed to increase speed, reduce latency, and improve flexibility of wireless services. It has a theoretical peak speed of 20 Gbps and its networks are virtualized, software driven and can exploit cloud technology. It is expected that 5G would create a cumulative impact of $ 1 trillion in India by 2035 through ushering in a digital revolution through:

- **High speed use cases (Enhanced Mobile Broadband, eMBB)**: Fast data would help speed up a range of applications such as enhanced consumer experience via high quality streaming, faster storage and access of cloud by businesses, better communication between public institutions and citizens. Greater realism in Virtual Reality, Augmented Reality and Extended Reality with lighter devices and immersive content will revolutionise education techniques, gaming, entertainment industries etc.
- **Mission-critical communication use cases (ultra-Reliable and Low Latency Communication, uRLLC):** This will provide seamless communication between entities making possible real time interactions. It will help in developing critical communications, such as drones would become a key tool to accelerate and support emergency situation response, connected sensors would be able to detect and warn about disasters quickly, road collisions would be prevented by use of connected vehicles sharing data.
- **Massive Internet of Things (IoT) cases (massive Machine Type Connectivity, mMTC):** 5G would seamlessly connect a massive number of embedded sensors in virtually everything through the ability to scale down in data rates, power, and mobility—providing extremely lean and low-cost connectivity solutions. It can be incorporated in areas like Smart City Infrastructure and Traffic Management, Industrial Automation, Wearables and Mobile devices, Precision agriculture etc.

However, to realise these potentials several **challenges need to** be addressed:

- **Technical Challenges:**
  - **Availability of spectrum:** There may be difficulty in availing some bands required for 5G because of allocation of the same to ISRO for satellite services.
  - **Electronic Equipment Manufacturing:** Complete 5G supply chain has high import dependency as imports account for about 90% of India's telecom equipment market.
- **Financial costs and high tax burden:** An additional investment of $60-$70 billion is required to seamlessly implement 5G networks. Also, close to 30% of revenue of telecommunication companies goes in taxes and levies, which includes import duty.
- **Infrastructural challenges:**
  - **Backhaul Infrastructure:** India lacks a strong backhaul to transition to 5G as only 25% cell sites in India are connected through fibers, which can offer low latency and unlimited capacity.
  - **Increasing role of memory and storage infrastructure:** With 5G, the quantum of data generated from users' devices multiplies, resulting in more data that has to be stored, moved, processed and secured. This brings a need for large-scale enhancement in memory and storage infrastructure.
  - **Lack of uniform policy framework:** Delays due to complex procedures across states and non-uniformity of levies along with administrative approvals impact telecom service providers negatively.
  - **Digital divide:** Since 5G is feasible in more populated areas, it may widen the digital divide in urban and rural areas where user density would be relatively low and regions with poor digital infrastructure.
- **Cyber security and privacy concerns:** Over 7 trillion wireless devices will be connected by 5G to serve over 7 billion people. This would create multiple security threats.

Though 5G technology has the potential for ushering a major socio-economic transformation in India, it poses several national security threats as well. Therefore, there is a widespread concern also over potential misuse of technology through use of Chinese devices, especially in border and other sensitive areas.

18. Besides computing, quantum technology has potential applications in various areas. Discuss. What are the challenges which lie ahead for effective utilization of quantum technology?
(250 words) 15

Approach:

- Briefly explain quantum technology in introduction.
- Mention its applications.
- Mention the challenges associated with quantum technology.
- Conclude accordingly.

Answer:

Quantum technology is a class of technology that works by using the principles of quantum mechanics i.e. the **physics of sub-atomic particles**. The understanding of quantum physics led to the development of lasers, resonance-imaging systems, transistors and computer chips earlier. Recently, these technologies are being utilised for:

- **Quantum computers**: They are built from "quantum bits" (basic units of information equivalent to 'bits' of a computer) and exploit the principle of superposition and entanglement to process vast amounts of data faster than ever before to **search databases, solve equations, and recognise patterns**. They have the potential **to train artificial intelligence systems**, e.g. for digital assistants that help doctors to diagnose diseases and suggest the most promising therapy, or to optimise the routes of all cars in a city simultaneously to avoid traffic jams and reduce emissions.
- **Quantum simulators:** These will be the key to **designing new chemicals**, from drugs to fertilisers for future medicine and agriculture, and of new materials, such as high-temperature superconductors for energy distribution without losses.

- **Quantum communication**: A typical implementation of quantum networks uses single photons. If anything intercepts a single photon it will be noticed, meaning that with quantum technology **we can achieve the most secure form of communication known, impossible to intercept without detection**.
- **Quantum sensing and meteorology**: Quantum sensors provide the **most accurate measurements** and will drastically increase the performance of consumer devices and services, from medical diagnostics and imaging to high-precision navigation, to future applications in the Internet of Things. They can **detect the tiniest disturbances** on even an electron, smallest possible charges or on some magnet**.** Quantum metrology uses quantum sensors to define various standards for e.g**. time-keeping, electrical measurements etc**.

However, following challenges exist in effective utilisation of quantum technology:

- **Operational Challenges:**
  - It is not possible to clone qubits as **perfect cloning of a quantum state is impossible**. Therefore, many common computer programming techniques that depend on copying the value of a variable cannot be used with quantum technology.
  - It is **impossible to read the same qubit twice**. This property is of immense use in secure communications where unforgeable cryptographic keys are generated. However, it can create difficulties in computing especially when a programme has to be tested before running it.
- **Engineering Challenges**:
  - Developing quantum technology is very difficult as most quantum systems exist only in a **laboratory environment**.
  - Qubits are highly sensitive to external interference. Current attempts to overcome noise (unwanted variations in data that interferes with computations and leads to errors) require laboratory settings. Without solving the **problem of noise**, quantum systems cannot reach their full potential.
  - Another challenge is increasing **the number of qubits on a processor chip**. Quantum computers would require qubit processors with hundreds or even millions of qubits to complete complex computations accurately. However, current quantum computers possess a maximum of 53 qubits only.
  - The new quantum computers also require ecosystems of **supporting software, hardware, and algorithms**. Developing these additional items have their own scientific and engineering challenges.

To keep in pace with this disruptive technology, India launched a National Mission on Quantum Technologies and Applications in 2020. However, it would require skilled people in quantum mechanics and a sound infrastructure to implement their research. There is a need to involve the private sector as well.

19. While most insurgent groups in North-East India have given up violence and are engaged in peace talks with the government, a number of issues could create hurdles in the future. Discuss. (250 words) 15

Approach:

- Write in brief about insurgency in North-eastern region.
- Discuss how insurgent groups in the North-East India have given up violence and are engaged in peace talks with the government.
- Highlight a number of issues, which can create hurdles in the future.
- Conclude with a way forward.

Answer:

Ethnic insurgency is one of the most significant challenges that India has faced in the Northeast. Starting with the Naga insurgency in 1956, various ethnic groups including the Meiteis, Mizos, Tripuris and Assamese have successively risen to assert their distinct identities and political aspirations. However, almost all the major insurgent groups in the region, except the Meitei

insurgents, have entered into a ceasefire or Suspension of Operation (SoO) agreements with the Union and/or state governments in last few years, such as:

- **Accord with Bodos:** A tripartite agreement between the Centre, state of Assam and National Democratic Front of Bodoland has been signed and armed cadres have been completely disbanded in 2020.
- **Militant surrender in Assam:** More than 600 militants belonging to **eight different militant outfits** including the United Liberation Front of Assam-Independent (ULFA-I), the Kamtapur Liberation Organisation (KLO) and the Rabha National Liberation Front (RNLF) surrendered in Assam recently.
- **Peace Accord with Nagas:** In 2015, an agreement was signed between Union government and Nationals Socialist Council of Nagaland-Isak-Muivah (NSCN-IM) to resolve the demand of Greater Nagalim. In 2019, NSCN (Khango) also entered into a ceasefire agreement.
- **SoO Agreements in Tripura**: In 2019, the **National Liberation Front of Twipra - Subir Debbarma** (NLFT-SD) agreed to abjure the path of violence, join the mainstream and abide by the Indian Constitution.

There has been significant reduction in violence in the North-East and states such as Mizoram and Tripura have become entirely free of insurgent violence, still there remains a number of issues that have the potential to increase the level of violence in the region:

- **Indeterminate peace talks**: Though a Peace Accord has been drafted and finalized recently, the NSCN-IM remains unsatisfied. Similarly, peace talks with the Assam-based insurgent group such as the ULFA (PT) were supposed to have concluded by December 2019 but are stuck over sovereignty issues.
- **Indulgence in criminal activities**: In the absence of a clear roadmap for rehabilitation, the surrendered militants feel frustrated. In many cases, they leave the camps and resort to criminal activities to supplement their income.
- **Poor implementation of ceasefire agreements:** The government has not been able to enforce the ceasefire agreements among different warring groups, which has resulted in numerous turf wars and armed rivalries. For example, the NSCN (IM) has been found violating the agreement several times since 2015.
- **Active insurgent groups beyond Indian borders**: ULFA-I and Meitei separatist outfits are reportedly hiding at different locations in Myanmar. It has also been found that top insurgent leaders like Paresh Baruah of ULFA-I are camping in China.
- **Anti-CAA agitation:** Implementation of the Citizenship Amendment Act, 2019 (CAA) in Assam's non-scheduled areas has generated resentment against the Union government, where youths are being mobilized and recruited by the insurgents. Militant groups such as NLFT also consider CAA as an attack over sovereignty of Tripura.

To resolve the above issues, government should take more proactive steps. The autonomous district councils in the region should be empowered. There is a need for better border management to resolve illegal immigration issue and to check safe havens for insurgents. Also, arbitrary use of Armed Forces Special Powers Act (AFSPA), 1958 should be checked. Lastly, it should focus on development of the region and connectivity between the North-East region and the rest of the country should be enhanced.

20. Identifying the key vulnerabilities in India's cyberspace, discuss the framework which should be adopted in the envisaged new cyber security policy in India. (250 words) 15

Approach:

- Briefly explain cyberspace.
- Explain key vulnerabilities in India's cyberspace.
- Mention a framework that should be adopted in a new cyber security policy.
- Conclude on a futuristic note.

Answer:

Cyberspace is a complex environment consisting of interactions between people, software and services, supported by worldwide distribution of information and communication technology (ICT) devices and networks. It is vulnerable to a wide variety of incidents, whether intentional or accidental. Also, the data exchanged in cyberspace can be exploited for nefarious purposes by both nation- states and non-state actors.

In the context of India, the cyberspace faces following vulnerabilities:

- **Absence of legislation:** India does not have a dedicated cyber security law. The existing IT Act, 2000 is not fully in sync with the evolving nature of cyber threats.
- **Absence of future plan of action:** The share of India's digital economy is expected to rise up to 20% of its total economy by 2024. Further, India has the second largest internet user base after China. Still, it does not have any plan of action related to development of bilateral and multilateral partnerships.
- **Surveillance and privacy:** Democratic freedom in India is susceptible to government encroachment e.g. the Central Monitoring System (CMS) can intercept voice and data traffic in India without judicial sanction in the name of national security.
- **Organisational overlap**: India has 36 different central bodies that deal with cyber issues, and each has a different reporting structure. Every state government also has its own CERT. However, there is no centralised command to inspect and coordinate efforts to handle broader cybersecurity issues.
- **Lack of indigenous products:** Indian market is full of Chinese devices, pirated and unlicensed software which exposes them to cyber risks.
- **Lack of skilled professionals**: According to IBM, as of 2018 there was a shortage of 3 million cyber security professionals in India.
- **Lack of cybersecurity awareness**: People are not aware about the different types of cyber threats and how to remain protected while surfing the internet. Further, young people are increasingly using the internet and are succumbing to games like blue whale, cyber-bullying etc.

Therefore, there is an urgent need to update 2013 policy and develop a new cyber security policy with a framework incorporating the following elements:

- **Public-private synergy**: There is a need for public-private partnership for formulating policies and regulations and for creating a cybersecurity education programme for the private sector and common masses.
- **Transparency and accountability**: The policy should clearly identify, define and mention various critical information and infrastructure; the roles and responsibilities of various organisations and various methods and techniques to be used for surveillance and data collection methods.
- **Regional cyber defence centre**: Specialised cyber units should be formed at state level comprising officers who have domain knowledge. They should also be attached to a centralised command.
- **Plan of action**: There must be an action plan to deal with state-sponsored attacks. An SOS lockdown policy should also be in place to take critical infrastructure off the internet immediately, in case of an attack.
- **Legal reforms:** There should be a Data Protection Act and an independent Data Protection Authority to ensure its compliance. Also, the IT Act needs to be amended to include various forms of cybercrimes, adjudication of cyber disputes, government mandated surveillance of digital communication, and intermediary liability.

Cyberspace offers a new dimension to traditional warfare. The Internet Crime Report 2019 of FBI has revealed that India stands third in the world among top 20 countries that are victims of cyber-crimes. Therefore, there is a need to evolve appropriate technologies for intelligence generation and data analytics.