

CS Mains G.S - III

Part - 1

NOTE:As the question on this topic may not come in the exact form in C. S Main Examination we have given slightly more information so that candidates can answer a question on this topic even if it is differently framed. Though care has been taken to give accurate information, if there are any inaccuracies, please write to us at rcreddy.testseries@gmail.com . It will be referred to the experts and, if need be, correction will be made.

Q1. Recently Tata Motors unveiled "Brabo"- India's first indigenous industrial robot which is expected to drive automation in the Industry. Do you think India should encourage usage of robots in its manufacturing industries considering demographic dividend and unemployment challenges? Discuss.

The field of robotics is fast developing and is finding applications in every sector of economy. It has the potential of revolutionizing the manufacturing and assembling processes. In a country like India where there is unemployment and increasing working population, the governments are facing dilemma of whether they should encourage robots which substitute human labour, whose merits and demerits are discussed below :

Advantages

- Robots are reliable, flexible, efficient, effective and obedient. This would improve productivity.
- It scales up production and improves competitiveness in global markets . This would provide the impetus to "Make in India ".
- It eliminates human errors and improves quality of production.
- It can relieve humans from repetitive, hazardous, and unpleasant labour.
- Robots require only power supply and periodic maintenance as opposed to wages and union problems.

Disadvantages

- It can displace the human labour in large numbers leading to structural unemployment. In order to find other work, an individual may have to relocate, which is another source of stress.
- Workers unions may oppose the move resulting in political uncertainty.
- Automation is capital intensive task and requires higher level of maintenance, hence requires high investments. MSME sector may not cope up with the competition.
- Increased dependence on imports of automation technologies which could lead to depletion of foreign reserves (as Indian lags in Robotics R&D)

Way forward: Indian manufacturing sector can opt for automation in firms that require technological advanced products (eg. gas turbines). On the other hand it can regulate the usage of the automation in labour intensive firms like textiles, shoe making, handicrafts, etc..

Alternate conclusion :

The advantages that automation of manufacturing industry offers, makes robots indispensable in a competitive and globalised world.

The first Industrial revolution has introduced machines into industry which improved the productivity and efficiency . Though it resulted in unemployment in short run, it created a chain reaction which

improved standard of living in long run. Similar case can be made for robotics too. For instance, Germany's progress in automation of automobile industry reduced jobs at factories, it increased them in the R&D sector. Indian Government should ensure that adequate steps are taken to improve the skill of labour so that they are employed in allied sectors of robotics like R&D, operating, maintenance and so on. 'Skill India' programme launched recently is a step in right direct to leverage demographic dividend advantage.

Q2. Despite successful launches of Chandrayaan and Mangalyaan, ISRO is not able to attract global space satellite launch business. Ariespace of France is a leader in Asia-Pacific region with 64% of the launch market. What are the reasons for this and suggest necessary measures.

Despite several achievements, ISRO is not able to attract global space satellite launch business due to following reasons:

- **Most of the launches are Nano Satellites:** Majority of the foreign satellites launched are nano satellites (1–10 kg) and micro satellites (11–100 kg). However, the launch market is moving towards 3-7 ton payloads for telecommunications, broadcasting, and weather forecasting services.
- **Over dependence on PSLV:** All the launches of foreign satellites were made by PSLV into LEO. Currently, almost half of the commercial satellite launch market constitutes of GEO launches. In order to compete in the multi-million dollar GEO satellite launch market, India needs to increase the success rate of its GSLV system, which is capable of launching satellites weighing 4 to 6 tonnes.
- **Clients:** None of the neighboring countries are using India to launch their satellites. Sri Lanka and Pakistan, for instance, prefer China for their satellite launch needs. Along with South Asia, India needs to expand its customer base to regions like Latin America, Africa, the Middle East, and Southeast Asia using various multilateral arrangements like SAARC, BRICS, APEC, etc. Recently PM Modi called on ISRO to develop a satellite as a gift to India's neighbors in the SAARC. This is a step in right direction.
- **Very few Launch Sites:** At the moment, India has one site with two operational launching pads, at Sriharikota. This enables ISRO to perform only two to four launches per year. By comparison, nations such as the US, Russia, and China often conduct 20 or more launches per year. To gain ground in the commercial launch market India needs to develop new launching pads and sites. In this regard, a proposal for developing Tuticorin as a new launch site is under consideration.
- **Lack of Private sector participation:** Though ISRO is a R&D unit, it is involved in manufacturing of launch vehicles and satellites. Private sector can play an aiding role here by taking up the manufacturing activity.

Q3. What is net neutrality? What are the pros and cons of net neutrality? Do you think Free Basics of Facebook violates net neutrality?

Net Neutrality means ensuring that all end users are able to access the Internet content, applications and services of their choice at the same level of service quality, speed and price, with no priority or degradation based on the type of content, applications or services. Under this view, data is transmitted on a "best effort" basis, with limited exceptions.

S.No	Pros	Cons
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1	Net Neutrality lowers the barriers of entry for entrepreneurs, startups and small businesses by ensuring the Web is a fair and level playing field.	Sponsored content and “pay-to-play” schemes can help companies improve the overall service they offer by charging more to heavier internet users. With that extra money ISPs could increase the bandwidth for all internet users.
2	We need the open Internet to foster job growth, competition and innovation.	Net Neutrality is against free market rules
3	ISPs are by definition the gatekeepers to the Internet, and without Net Neutrality, they would seize every possible opportunity to profit from that gatekeeper control.	Regulation for net neutrality may limit the tools of governments and ISPs to fight against infringement of copyright laws
4	Thanks to economic inequality and runaway media consolidation, common man’s voice is not being heard. The open Internet gives marginalized voices opportunities to be heard	Net neutrality rules make more difficult to monitor and control controversial adult content.
5	Without neutrality, high-speed internet for entertainment could be prioritized over education	Thanks to sponsorships some mobile telecom operators may offer free internet access to some contents

According to Facebook, free basics is an open platform that gives Indian developers the opportunity to make their services and websites available free of cost to those who cannot afford internet access. However, this free access is limited to partner websites and applications. It was launched two years ago globally in partnership with Samsung, Ericsson, MediaTek, Opera Software, Nokia and Qualcomm. Facebook is partnering with ISPs to provide preferential and selective access to a set of app developers and services. This is the main criticism of those opposed to Free Basics. So, I believe that free basics of Facebook violates net neutrality.

Q4. Carbon Nanotubes (CNTs) are revolutionizing the fields such as healthcare sector, processor manufacturing, energy storage, molecular electronics, water filtration, structural engineering, fibers, fabrics and ceramics. What are the properties of CNTs which make them so unique?

1. Electrical conductivity: CNTs can be either metallic or semi-conducting in their electrical behavior. Their conductivity has been shown to be a function of their chirality (degree of twist), as well as their diameter.
2. Strength and elasticity: CNTs are expected to be the ultimate high-strength fibers. Single Wall NanoTubes (SWNTs) are stiffer than steel, and are very resistant to damage from physical forces.
3. Thermal conductivity and expansion: CNTs may be the best heat-conducting material man has ever known. Ultra-small SWNTs have even been shown to exhibit *superconductivity* below 20°K.

4. Field emissions: The small diameter and high aspect ratio of CNTs is very favorable for field emission. Even for moderate voltages, a strong electric field develops at the free end of supported CNTs because of their sharpness.
5. Aspect ratio (the ratio of the width to the height): CNTs have proven to be an excellent additive to impart electrical conductivity in plastics. Their high aspect ratio (about 1000:1) imparts electrical conductivity at lower loadings, compared to conventional additive materials such as carbon black, chopped carbon fiber, or stainless steel fiber.
6. Absorbency: The large surface area and high absorbency of CNTs make them ideal candidates for use in air, gas, and water filtration. A lot of research is being done in replacing activated charcoal with CNTs in certain ultra high purity applications.
7. Density: In addition to being strong and elastic, carbon nanotubes are also lightweight, with a density about one quarter that of steel.
8. Wettability: The surface wettability of CNT is of importance for its applications in various settings. The contact angles of most as-synthesized CNT arrays are over 160°, exhibiting a superhydrophobic property.
9. Kinetic properties: Multi-walled nanotubes are multiple concentric nanotubes precisely nested within one another. These exhibit a striking telescoping property whereby an inner nanotube core may slide, almost without friction, within its outer nanotube shell, thus creating an atomically perfect linear or rotational bearing. This is one of the first true examples of molecular nanotechnology, the precise positioning of atoms to create useful machines

Q5. There is little doubt that recombinant DNA technique has revolutionized biotechnology. Explain the steps involved in this technique and the arguments for and against this technology.

Recombinant DNA technology is a method of genetic engineering which is viewed as a cornerstone of biotechnology.

Technique: This technique which is a form of cloning at cellular level involves the following steps.

- a) Isolate the relevant sequence of nucleotides in the original DNA. Restriction enzymes, specialized proteins that act like molecular scissors, are used to cut double stranded DNA.
- b) Combine the isolated DNA with a vector which is a fragment of DNA that is able to transport genes from one organism to another.
- c) Insert the vector containing the gene to be transferred into a bacterium such as E.coli.
- d) Within few hours this bacteria will multiply thousands of times to produce millions of cells with exact same copy of the gene inserted by scientists.

Arguments Against:

- a) Unpredictability: New kinds of hybrid plasmids or viruses, with biological activity of unpredictable nature, may eventually be created
- b) Safety Concerns: This technique is applied in large scale in agriculture. The effect of genetically modified crops (GM crops) on health and the environment is still not clear.
- c) Environment concerns: It can lead growth of undesired variants such as pest resistant fungi
- d) Clinical trials: The clinical trials during the research stage can have very adverse effects on the subjects
- e) Ethical dilemma: We are all part of god's creation. It is unethical to create new species.
- f) Bioterrorism: If it goes into the hands of terrorists, it can be devastating

Arguments For:

- a) This technology helps in developing improved medicines, improved livestock and crops. It is unwise to lose all the benefits that biotechnology offer to the mankind
- b) It can help in prevention of genetic diseases and to treat pre-existing conditions as in the case of cancer.
- c) Unpredictability is a risk involved in every field of research, not specific to biotechnology
- d) Strict guidelines can be kept in place to ensure that safety and environmental issues are well understood before commercial production takes place.
- e) Creating new varieties through crossing is age old practice. There is nothing unethical about it.
- f) Any technology can be used against humanity, if it goes to the hands of terrorists. This applies to biotechnology also. We need to strengthen research to handle that situation.

Q6. What is the significance of coral reefs? What do you understand by coral bleaching? Identify various threats to Coral reefs.

Coral reefs grow when there is an optimum temperature of 26–27 °C and depths are not over 50 meters (shallow depths). They offer myriad advantages

Advantages of Corals reefs:

- The reefs protect the mangroves from strong currents and waves that would damage them or erode the sediments in which they are rooted.
- Barrier reefs protect the mainland from the impact of high tides and enable port activities. The great Australian reef is one such example.
- Coral reefs particularly atolls across the world are famous for their natural beauty and are famous tourist destination. Maldives, Mauritius, West Indian islands etc.
- Reefs are home to a large variety of animals, including fish, sponges, shrimp, lobsters, crabs, sea turtles
- Some organisms feed on corals while others use the reefs for protection or breeding or hiding during hunt.
- They help in understanding the geological past.

Coral bleaching:

Corals contain zooxanthellae (algae) that live symbiotically within their tissue. This algae is responsible for the vibrant colours that coral colonies display. When this symbiotic relationship breaks down, it often leads to the coral's death. This phenomenon is called "coral bleaching" because the coral animal appears to turn white.

Threats to Coral Reefs

1. **Rising sea levels** due to climate change requires coral to grow to stay close enough to the surface to continue photosynthesis.
2. **Increasing water temperature** changes can induce coral bleaching as happened during the 1998 and 2004 El Nino years.
3. **Ocean acidification:** Increased CO₂ means increased acidification of water making it difficult for corals to secrete their CaCO₃ skeleton.
4. **Marine pollution:** Pollution arrives from land via runoff, the wind, industrial effluent release and oil spills. Some pollutants consume oxygen and lead to eutrophication, killing corals.

5. **Coral disease:** As temperatures increase the activities of harmful bacteria also increases harming corals. Higher temperature also causes stress in coral leading to lower immunity.
6. **Destructive fishing practices:** blast fishing or cyanide fishing destroy the colonies of coral reefs.

Q7. What are Intended National Determined Contributions (INDCs). Discuss the challenges of India in meeting its commitments under INDCs and suggest suitable measures in this regard.

Intended National Determined Contributions are the targets set by the countries and conveyed to the UNFCCC (United Nations Framework Convention for Climate Change) to address the challenge of climate change at their domestic level. These targets are not binding and they will be revised after 5 years i.e. in 2023.

The important **Indian INDCs** are (1) Reduce emission intensity of its GDP by 33-35 % by 2030 from 2005 levels. (2) Creation of additional carbon sink of 2.5 to 3 billion tons of CO₂ equivalent by additional forest cover. (3) Generation of around 40 % cumulative power installed capacity from non-fossil fuel resources by 2030.

Challenges :

1. **Development-environment dichotomy:** India being a developing nation with significant population below poverty, needs to address its own developmental aspirations. For instance, due to the increasing demand for land in India for urbanisation, industrial purposes etc., we are witnessing loss of forest cover at a rapid pace. In this context, achieving INDC commitments is a challenging task.
2. **Financial crunch:** It is estimated that approximately US \$ 2.5 trillion are needed to meet our INDCs. The existing mode of resource mobilization is not adequate to meet these targets.
3. **Transfer of technology :** The renewable energy technology is capital intensive, and the issue of intellectual property rights further complicates the technology transfer to India for indigenous production.
4. **Role of private sector and civil society :** There has to be a broad set of direction in order to synergize the efforts of all the stakeholders, where there are bound to be differences of opinions. For example NGOs like Green Peace oppose developmental projects in forest lands. Hence, arriving at a consensus among them is a pre requisite to realize our INDCs goals.

Suggestions :

1. **Financial aspects :** Issuing of Green bonds, laying of Green Cess on the lines of Krishi Kalyan cess, rising the levies on coal products, making the carbon market under Clean Development Mechanism more attractive are few domestic measures. Seeking financial support from global organizations like New Development Bank, Green Climate Fund etc. can supplement domestic efforts.
2. **Institutional reforms :** Carry out capacity building measures for agencies that are associated with the climate change, forest, renewable energy departments etc.
3. **Allocate more funds and collaborate with academia, private sector** to develop cheaper and efficient renewable energy technologies.
4. **Forest cover :** make effective utilization of funds from CAMPA to carry out afforestation, ensure the diversion of forestland is minimized. Green India initiative is a right step in this direction.
5. **Creation of awareness :** Environmental awareness among the people is needed which can be facilitated with association of NGOs, media etc. as their participation is vital.

Q8. Write a short note on

(a) Importance of Environmental Impact Assessment (EIA)

India is set on a high growth trajectory with rapid industrialization, urbanization which has an adverse impact on the environment. In this context of 'development-environment' dilemma, Environmental Impact Assessment (EIA) provides a rational approach to sustainable development.

An Environmental Impact Assessment (EIA) is a formal study process used to identify, predict and mitigate the environmental impact of a proposed development project on natural environment people and livelihoods. It is a scientific process of identifying future consequences -both beneficial and adverse- of a current or proposed action.

- EIA assists planners and government authorities in the decision making process by identifying the key impacts/issues and formulating mitigation measures.
- EIA **compares various alternatives** for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits. This ensures that development options are environmentally and socially sound and sustainable.
- It also **proposes measures to mitigate adverse effects** and predicts whether there will be significant adverse environmental effects, even after the project is implemented.
- Properly conducted EIA also lessens the conflicts by promoting community participation, informing decision makers, and helping lay **the base for environmentally sound projects**.

(b) Central Armed Police Forces

Central Armed Police Forces include **five security forces** under the authority of Ministry of Home Affairs. They are Border Security Force, Central Reserve Police Force (CRPF), Central Industrial Security Force (CISF), Indo-Tibetan Border Police (ITBP) and Sashastra Seema Bal (SSB).

1. **Central Reserve Police Force (CRPF)** is the largest of the Central Armed Police Forces. The CRPF's primary role lies in assisting the State/Union Territories in police operations to maintain law and order and counter insurgency. The Central Reserve Police includes:
 - **The Rapid Action Force (RAF)** is a anti-riot force trained to respond to sectarian violence.
 - **The Commando Battalion for Resolute Action (CoBRA)** is a anti-Naxalite/COIN (Counter Insurgency) force. They are specifically trained in guerilla warfare.
2. **Border Security Force (BSF)** mandate is to police the border along Pakistan and Bangladesh.
3. **Indo-Tibetan Border Police (ITBP)** is deployed for guarding duties on the border with China from Karakoram Pass in Ladakh to Diphu La in Arunachal Pradesh.
4. **Central Industrial Security Force (CISF)** is one of the largest industrial security forces in the world. It provides security to various PSUs and other critical infrastructure installations across the country.
5. **Sashastra Seema Bal (SSB):** The objective is to guard the Indo-Nepal and Indo-Bhutan Borders.

Q9. Even after six decades of independence, India's borders are still vulnerable to illegal immigration, terrorist infiltration, cattle smuggling, drug, human and arms trafficking. What are the factors contributing to difficulty of the task of managing Indian borders?

Managing Indian borders is difficult for several reasons:

- **Long border:** India has 14,880 kilometres of boundary which is fourth longest (after Russia, China and Brazil). All states except Madhya Pradesh, Chattisgarh, Jharkhand, Delhi, Telangana and Haryana have an international land border or a coast line.
- **Disputed borders:** unsettled or not fully demarcated land and maritime boundaries (China and Pakistan in particular) pose a major challenge. Frequent cross border firing and terrorist incursions along LoC is a manifestation of unsettled border with Pakistan.
- **Complex borders:** Indian borders runs through **a variety of ecological milieus-** plains, hills and mountains, deserts, riverine territories and marshes, each with its own unique problems. For example, India-Pakistan border runs from the hot Thar Desert in Rajasthan to the cold Himalayas in

Jammu and Kashmir. Similarly, the India-Myanmar boundary is along the lush tropical forests where as Indo-Bangladesh boundary is dissected by ever-shifting riverbeds.

- **Porous borders :** India shares unprotected border with Bhutan and Nepal. Further, Myanmar border is not completely fenced (until recently Bangladesh too). Anti-state elements (such as ULFA, NSCN) take advantage of this reality.
- **Hostile and Unstable neighbours:** India's neighbourhood is in turmoil undergoing political and economic instability. (Nepal, Myanmar, Afghanistan). Further, Pakistan policy of proxy war using terrorists along LoC is a major challenge.
- **Unfriendly border population:** Sense of alienation among the people residing along the border areas particularly in the North Eastern states (such as Nagas, Meitis, etc.).
- **Weak Institutional mechanisms** for coordinating intelligence gathering, sharing and intelligence coordination are weak. Border guarding forces are often under resourced, ill-equipped and are called upon other duties like disaster management.
- **Lack of adequate border infrastructure:** such as roads, border posts, flood lighting, communication networks, etc. make the task difficult to the border security forces.

Q10. "Cyberspace is evolving to become fifth potential theatre of war along with land, sea, air and space. However, there are several reasons that complicate the task of securing cyberspace compared to the other theatres of conflict." Explain.

Cyberspace is the term used to describe the virtual world of computer networks. Cyber security involves securing the physical infrastructure (undersea cables, fiber networks, data servers, etc.) that enables setting up and usage of communication networks and protecting the data that is stored, manipulated and transmitted through these networks. The task is particularly complex for the security services as cyberspace differs from other conventional arenas of conflict in following ways:

1. The national territory (land, air and sea) that is being defended by the military forces is well defined. Cyberspace is inherently **international** . It has no boundaries to defend.
2. The global Internet system, a key part of cyberspace, is still under **the control of one country** (USA). Hence national defence and international cooperation are inevitably intermeshed.
3. In cyberspace it is **very easy for an attacker to cover his tracks** and even mislead the target into believing that the attack has come from somewhere else. This difficulty in identifying the perpetrator makes it difficult to rely on the capacity to retaliate as a deterrent.(offers anonymity)
4. **The costs of mounting an attack are very modest.** The above two factors make cyberspace an ideal vehicle for states and non-state actors who choose to pursue their war aims
5. The technologies that are used in cyberspace are still very **new and are evolving rapidly**. Hence investing in technological capacities to keep track of global developments, developing countermeasures and staying ahead of the competition is as central to the defence of cyberspace.
6. Lack of adequate specialised workforce to ensure cyber security

In the recent past, besides Internet, many networks facilitating governance, financial institutions, security and service delivery have been setup like NATGRID, SWAN, NKN, NOFN, etc. So it's imperative that the Government takes all necessary steps to secure the cyberspace. The recent implementation of cyber security policy and digital army are steps in right direction.