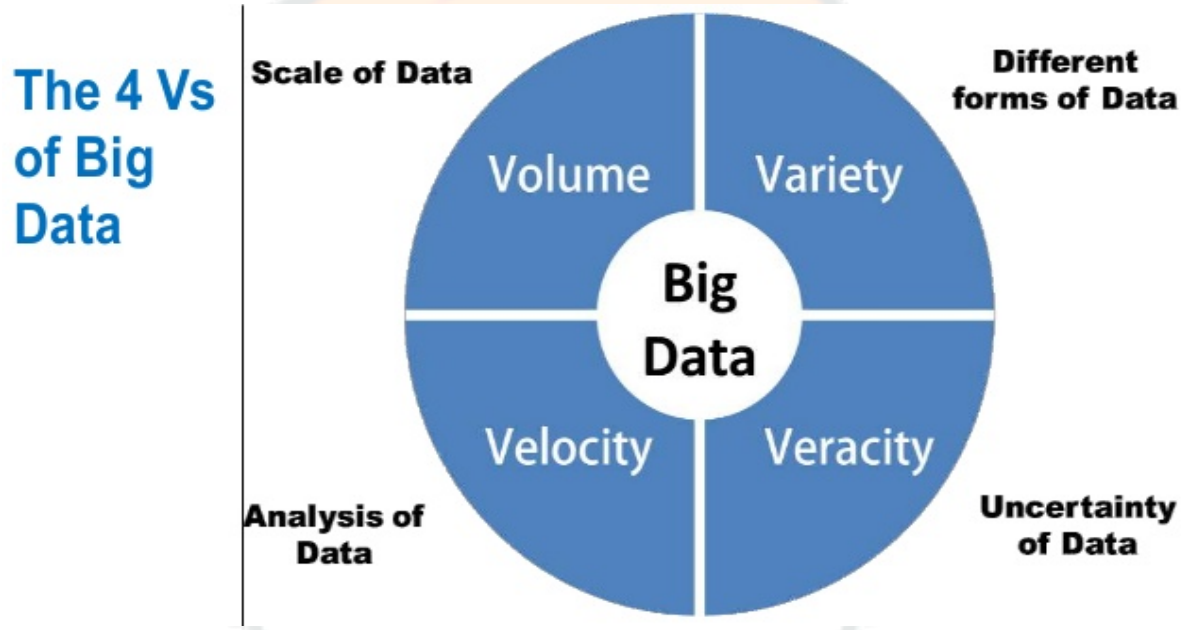
1. What is Big Data? What are its applications? Discuss.

Introduction

Big data is a term for data sets that are so large or complex that traditional data processing application software is inadequate to deal with them. It refers to the use of predictive analytics, user behaviour analytics, or certain other advanced data analytics methods that extract value from data.

Body



Applications:

Governance:

- Big data can be analysed for targeted delivery if schemes, maintain a record of beneficiaries, analyse the response of the electorate to policies, predict future trends and demands of the population
- Patterns of investment, savings and expenditure can be revisited with changing time and government can instil such changes in its policies
- Geo-tagging in MGNREGA can help analyse the effectiveness of the policy geographically and bring in required changes
- The Digital India and Smart Cities initiatives of the government also include efforts to utilise data to design, plan, implement, manage, and govern programmes.

Businesses:

- Help to understand customers profile and needs, keep centralized data of sales, maintain the individual history of each customer and deliver customized services.

Antibiotic Resistance

- Big data can provide insightful information about the unregulated sale of Antibiotics without prescription. The data generated can be used for developing statistical models to show the relationship between antibiotic consumption and associated resistance.

Urbanisation

- Massive amounts of data generated by cities can be used to improve infrastructure and transport systems as Singapore has done.

Agriculture

- **Seed Selection** - Big-data businesses can analyse varieties of seeds across numerous fields, soil types, and climates and select the best.
- **Weather** – Advanced analytics capabilities and agri-robotics such as aerial imagery, sensors help provide sophisticated local weather forecasts can help increasing global agricultural productivity over the next few decades.
- **Insurance**: Crop-related ground data helps crop insurance companies for accurate assessment of risk and speedy settlement of claims.

Science and Technology:

- Research data can be captured at more depth and analysed in a better way. For example, data at Large Hadron Collider for atomic research. In future we are moving to the Internet of Things which will be based on machine-to-machine communication and each machine will have several Gigabytes if data about itself and others for simulating processes.

In social surveys also, now we can capture a larger sample of the population for evaluating trends and undercurrents. The use of information technology, open-source data, and proper governance will help in improving human development indices.

Conclusion

Big Data, Artificial Intelligence and Internet of things are going to change the world forever. Actively engaging policymakers and researchers is crucial to bring in cross-sectoral transformation.

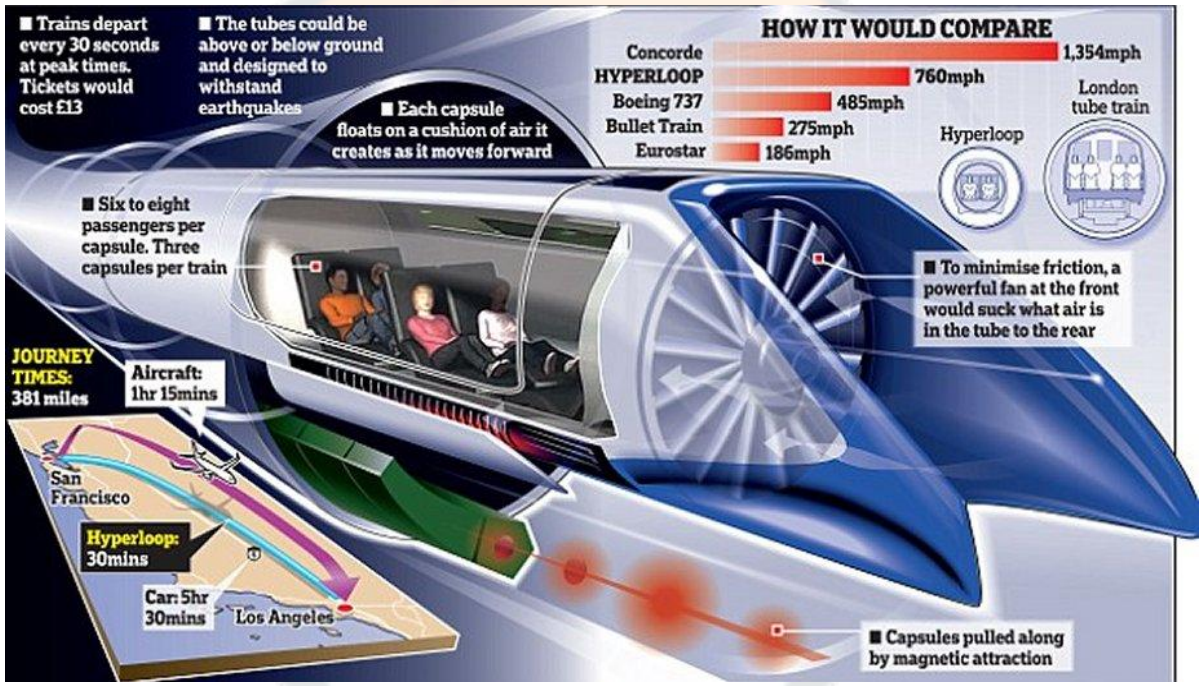
2. How does hyper loop technology for transportation work? Discuss.

Introduction:

Hyperloop is a new form of ground transport. It will have passengers travelling in floating pods within low-pressure tubes.

Body:

Hyper look technology for transportation:



- The basic idea of Hyperloop is that the passenger pods or capsules travel through a tube, either above or below ground. To reduce friction, most but not all of the air is removed from the tubes by pumps.
- Overcoming air resistance is one of the biggest uses of energy in high speed travel. Airliners climb to high altitudes to travel through less dense air; in order to create a similar effect at ground level, Hyperloop encloses the capsules in a reduced-pressure tube, effectively allowing the trains to travel at airplane speeds but on the ground.
- In model, the pressure of air inside the Hyperloop tube is about one-sixth the pressure of the atmosphere on Mars. This means an operating pressure of 100 pascals, which reduces the drag force of the air by 1,000 times relative to sea level conditions, and would be equivalent to flying above 150,000 feet altitude.

- The pod would get its initial velocity from an external linear electric motor, which would accelerate it to 'high subsonic velocity' and then give it a boost every 70 miles or so; in between, the pod would coast along in near vacuum.

Benefits:

- Supporters argue that Hyperloop could be cheaper and faster than trains and car travel, and cheaper and less polluting than air travel.
- It's also potentially two or three times faster than even high-speed rail (and ten times the speed of regular rail services).
- They claim that it is quicker and cheaper to build than traditional high-speed rail; as such, Hyperloop could take the pressure off gridlocked roads, making travel between cities easier and potentially unlocking major economic benefits as a result.
- Being cheaper to build should mean these services can become profitable quickly.

Challenges:

- Plenty of engineering challenges need to be tackled which could push the costs up. Like building the tubes strong enough to deal with the stresses of carrying the high-speed pods, finding energy and cost efficient ways to keep them operating at low pressure.
- Lots of pods will be required to achieve the same passenger numbers as more traditional rail which uses much bigger carriages.
- How these services will be funded in the first place is not clear. These services can be financed through a combination of public and private investment.

Conclusion:

The technology is nascent as no hyperloop has actually been developed on a long distance. India has time to develop expertise in the field. Partnerships with companies like HTT and Virgin Hyperloop will help India decide as to how the technology can be cost effective. Also, meanwhile improving basic necessities like food, access to energy and house should be focused.

3. What are the concerns over the use of genetically modified (GM) products? Do you find these concerns relevant? Haven't many other countries embraced GM products? Critically comment.

Introduction:

Genetically modified Products contain genomes which are engineered in the laboratory to favour the expression of desired physiological traits or the production of desired biological products.

Body:

GMOs produced through genetic technologies have become a part of everyday life, entering into society through agriculture, medicine, research, and environmental management. However, while GM products have benefited human society in many ways, some disadvantages exist; therefore, the production of GM Products remains a highly controversial topic in many parts of the world.

Concerns over the use of genetically modified (GM) products:

There are unknown consequences of altering the natural state of an organism through foreign gene expression. After all, such alterations can change the organism's metabolism, growth rate, and/or response to external environmental factors. These consequences influence not only the GMO itself but also the natural environment in which that organism is allowed to proliferate. Potential health risks to humans include the possibility of exposure to new allergens in genetically modified foods, as well as the transfer of antibiotic-resistant genes to gut flora.

Area Of Concern	Relevance
Health	They can have harmful effects on the human body. It is believed that consumption of these genetically engineered foods can cause the development of diseases which are immune to antibiotics.
Environment	This GM method can cause damage to other organisms that thrive in the environment and can create ecological imbalances. The risks of “tampering with Mother Nature”.
Genetic	Genetic changes will become permanent and irreversible with times, and undesirable and uncontrolled mutations can occur.
International Trade	With the increase of GM Products, developing countries would start depending more on industrial countries because it is likely that food production would be controlled by developed countries in the time to come.
Sustainability	The evolution of resistant pests and weeds termed superbugs and superweeds is another problem. Resistance can evolve whenever selective pressure is strong enough. This can cause the evolution of resistant insects in a few years and nullify the effects of the transgenic.
Religious	Many religious and cultural communities are against such foods because they see it as an unnatural way of producing foods. Many people are also not comfortable with the idea of transferring animal genes into plants and vice versa.
Awareness and Labeling	Manufacturers do not mention on the label that foods are developed by genetic manipulation because they think that this would affect their business, which is not a good practice.

Some benefits of GM Products:

- Increased crop yields.
- Reduced costs for food or drug production.
- Reduced need for pesticides.
- Enhanced nutrient composition.
- Enhanced food quality and better test.
- Resistance to pests and disease.
- Greater food security,
- Medical benefits to the world's growing population.
- Increase the yield of animals for milk and meat production.
- Decrease susceptibility to disease in animals.
- Allowing plants to grow in conditions where they might not otherwise flourish.
- Increased shelf life and hence there is less fear of foods getting spoiled quickly.
- Growing food free from chemicals and pesticides.

Some GM Products:

- GM maize
- GM soybeans
- GM potatoes
- GM rice
- GM cotton
- GM peas
- GM Cow

The response of other countries towards embracing GM:

The way governments have regulated GM foods varies. In some countries, GM foods are not yet regulated. Countries which have regulatory provisions for GM foods usually also regulate GMOs in general, taking into account health and environmental risks, as well as control- and trade-related issues (such as potential testing and labelling regimes).

- About 90 per cent of the corn, cotton, and soybeans planted in the United States were GM.
- The EU allows for the import of certain GM crops. Within Europe, however, only one GM crop, a type of insect-resistant corn (maize), was cultivated.
- Countries such as Canada, China, Argentina, and Australia, had open policies on GM products.
- Japan is a leading GM food importer but has not grown GM food crops.
- Eleven countries grew modified soybean, with the USA, Brazil and Argentina accounting for 90% of the total hectare.
- Seventeen countries grow GM maize and fifteen grow GM cotton.
- Most of GM canola was grown in Canada.
- In Bangladesh, a GM eggplant was grown commercially for the first time.
- In India, only GM- cotton is produced.
- Some countries, including certain African states, had rejected GM products.

Conclusion:

The GM foods have the potential to solve many of the world's hunger and malnutrition problems and to help protect and preserve the environment by increasing yield and reducing reliance upon synthetic pesticides and herbicides. Genetic engineering is the inevitable wave of the future and that we cannot afford to ignore a technology that has enormous potential benefits.

4. Examine the legal framework related to intellectual property rights in India? Is it a progressive one? Critically examine.

Introduction:

In the backdrop of rapid globalization and liberalization of economies globally, the emergence of "Intellectual Capital" as a key wealth driver of international trade between countries has led to Intellectual property rights becoming an irreplaceable element. India too has a Trade Related Aspects of Intellectual Property Rights (TRIPS) compliant, equitable and dynamic IPR regime.

Body:

Existing legal framework for IPR:

a. India's legal framework caters to the following areas of intellectual property:

- Trade Marks: Trade Marks Act, 1999
- Patents: The Patents Act, 1970 (amended in 2005)
- Copyrights: The Copyright Act, 1957(amended in 2012)
- Industrial designs: The Designs Act, 2000
- Geographical indications: The Geographical Indication of Goods (Registration and Protection) Act, 1999
- Layout designs of integrated circuit: The Designs Act, 2000
- Varieties of plant: The Protection of Plant Varieties and Farmers Rights Act, 2001
- Information Technology and Cybercrimes: The Information Technology Act, 2000
- Data protection.
- Traditional Knowledge: Traditional Knowledge Digital Library.

A comprehensive **National IPR policy** has been approved that will not only stimulate innovation and creativity across sectors, but also provide a clear vision regarding IPR issues.

- IPR Awareness: Outreach and Promotion - To create public awareness
- Generation of IPRs.

- Legal and Legislative Framework: To balance the interests of rights owners with larger public interest.
- Administration and Management.
- Commercialization of IPRs.
- Enforcement and Adjudication: For combating IPR infringements.
- Human Capital Development: To strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs.

Commendable progressiveness of the policy:

- Trademark offices have been modernized with the aim to reduce the time taken for examination and registration to just a month.
- The Policy also seeks to facilitate domestic IPR filings, for the entire value chain from IPR generation to commercialization.
- It aims to promote research and development through tax benefits.
- Films, music, industrial drawings will be all covered by copyright
- IPR Ensures Safeguards for Indian Pharma Industry ensuring the availability of essential and life-saving drugs at affordable prices.
- It gives a strong message of supporting the Make in India Campaign.
- Lots of steps for Start-Ups have been recommended in the policy. The copyright subject matter has been shifted to help achieve objective of utilitarian industries like software, telecom and many more.
- It will allow compulsory licensing with restrictions in case of a public health emergency such as epidemics.
- Pro-IP policies of the Government such as 'Accelerating Growth for New India Innovations', 'Start-up India' and 'Digital India', was considered as one of the few reasons for improvement in the ranking in the 2019 International Intellectual Property (IP) Index, at 36th position among 50 countries.

Criticism of the existing framework:

- The policy lacks empirical rigour and appears more faith-based than fact based. It endorses a very formalistic and reductionist view of IP.
- It is not based on empirical studies and stakeholder surveys and but on intuitions and assumptions. It ignores other factors such as education and cultural aversion to risk.
- It is comparatively silent on the issue of traditional knowledge and the informal creativity/innovations.
- WIPO statistics suggest that patenting by Indian public research organizations (PROs) and universities is still quite limited.

- India's IP registration offices are overburdened and there are yawning gaps in enforcement of the policy.
- Multiple problems are still faced by pharmaceutical, software, biotechnology, automotive, movie, music and other technology-led, IP-intensive industries due to weak behavioural approach.
- India is named in the US- priority watch list to highlight the poor implementation especially in checking digital piracy and compulsory licensing.
- 36 out of 50 countries is still a disappointing rank, and show a lack of effective innovative growth.

What steps have been taken?

- Strengthening of Institutional Mechanism: All IPRs under one umbrella and one Appellate Board have been institutionalised.
- Establishment of Cell for IPR Promotion and Management (CIPAM) to assist in simplifying and streamlining of IP processes.
- Clearing backlog/reducing pendency through targeted augmentation.
- Business provisions have been re-engineered to make it user friendly and CPGRAMS for grievance redress.
- IPRs included in school syllabus and IPR Enforcement Toolkit for Police.

Conclusion:

The legal setup in India nicely tries to balance public rights with private rights and provides adequate incentives for entrepreneurs to innovate. However, implementation of various laws has been lax, with patent or copyright infringement and piracy not uncommon. Therefore, a holistic and a more progressive policy can ensure the growth of the abundance of creative and innovative energies flowing in India.

5. What is internet of things (IoT)? What can be its day to day applications? Discuss.

Introduction

The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

Body

Applications of internet of things:

- **Smart home**: Smart Home has become the revolutionary ladder of success in the residential spaces and it is predicted Smart homes will become as common as smart phones.
- **Smart cities:** IoT will solve major problems faced by the people living in cities like pollution, traffic congestion and shortage of energy supplies etc. Products like cellular communication enabled Smart Belly trash will send alerts to municipal services when a bin needs to be emptied.
- **Agriculture:** Farmers are using meaningful insights from the data to yield better return on investment. Sensing for soil moisture and nutrients, controlling water usage for plant growth and determining custom fertilizer are some simple uses of IoT.
- **Energy utilization:** Smart Grids will also be able to detect sources of power outages more quickly and at individual household levels like nearby solar panel, making possible distributed energy system.
- **Healthcare:** The collected data will help in personalized analysis of an individual's health and provide tailor made strategies to combat illness.
- **Connected car:** It has the responsibility of making decisions with consistency, accuracy, and speed. It also has to be reliable.
- **Manufacturing:** The IoT intelligent systems enable rapid manufacturing of new products, dynamic response to product demands, and real-time optimization of manufacturing production and supply chain networks, by networking machinery, sensors and control systems together.
- **Environmental monitoring**: to assist in environmental protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements' of wildlife and their habitats.
- **Supply chain:** By placing RFID or NFC tags on individual products, the exact location of single items in a large warehouse can be shared, thus saving search time, streamlining infrastructure, and lowering labour costs.

Disadvantages of internet of things:

- **Breach of privacy:** Day to day life is monitored and recorded. There is always the possibility of hackers breaking into the system and stealing the data.
- **Over-reliance on technology:** Relying on technology on a day to day basis, making decisions by the information that it gives up could lead to devastation. No system is robust and fault-free.
- **Loss of jobs:** Due to swift and precision making work there will be sack of jobs
- **Security:** As the IoT systems are interconnected and communicate over networks. The system offers little control despite any security measures, and it can be lead the various kinds of network attacks.
- **Complexity:** The designing, developing, and maintaining and enabling the large technology to IoT system is quite complicated.
- **Technology Takes Control of Life:** Our lives will be increasingly controlled by technology, and will be dependent on it

Conclusion

Every new technology faces a million challenges in its initial phases. Internet of Things also poses some grave issues that need to be tackled well in order to utilize its fullest potential.