1. What are autonomous microrobots? What are their applications? Discuss.

Introduction

A microrobot is a miniaturized, sophisticated machine designed to perform a specific task or tasks repeatedly and with precision. Microrobots typically have dimensions ranging from a fraction of a millimeter up to several millimeters.

Body

An autonomous microrobot contains its own on-board computer, which controls the machine and allows it to operate independently.

- Microbots work on the same principle as that of an industrial robot.
- Primary components of a robot:
- A sensor to sense the stimuli from the environment
- An actuator to perform the mechanical actions like moving, lifting, dropping etc.
- A microcontroller to enable communication between sensors and actuators
- A power source to power all the parts of a robot
- A platform which houses all these parts
- A software that instructs working of various parts

Applications

Due to their small size, microbots are potentially very cheap, and could be used in large numbers (swarm robotics) to explore environments which are too small or too dangerous for people or larger robots.

- Drug delivery
    - Microbots are increasing seen as the technology of the future for drug delivery replacing the current invasive techniques. It can do drug delivery and stem cell delivery to a particular region of the body.
    - Another promising application is the monitoring of chemical and physical parameters inside the body.
    - Eg: To destroy tumors in cancer, performing biopsy, destroy kidney stones, removing plaque in arteries and other surgeries.
- Neuroscience
    - Microbots can be used to study nerve signals in brain.
- Pollution
    - Microbots are seen as a solution to remove heavy metals such as lead, arsenic, mercury, cadmium, chromium etc. from water.
- Industrial applications
    - Microbots can be used to perform cleaning operations in industrial machines, IC engines etc.
- Cleaning of batteries

- Microbots can be used to clean batteries of electronic devices thereby increasing the life of batteries.

Some microbots are:

RoboBees: Autonomous Flying Microrobots
Insect-inspired robots with potential uses in crop pollination, search and rescue missions, surveillance, as well as high-resolution weather, climate, and environmental monitoring.

The masterminding of the RoboBee was motivated by the idea to develop autonomous micro-aerial vehicles capable of self-contained, self-directed flight and of achieving coordinated behavior in large groups

HAMR: Versatile Crawling Microrobot
Ambulatory and highly dexterous insect-inspired microrobots for diverse tasks in confined environments. Small or difficult-to-access spaces such as areas covered with rubble, or narrow pipes and engines can pose obstacles to search-and-rescue missions, repair works, or environmental and industrial monitoring. One solution for these problems could be small-sized robots that are able to navigate such spaces, transport payload, sense, and communicate.

Wyss Institute researchers have developed a 1.5 gram, insect-scale microrobot, called HAMR (short for Harvard Ambulatory Microrobot) with locomotion capabilities beginning to approach those of the insects, and with the opportunity to add even more functions.

Conclusion

In the next several years we will see serious improvement in performance of micro-robots and a rising number of start-ups that will use the potential of micro-robotics to boost innovations. One thing is clear – our life will be more and more influenced by robotic technologies. Micro-robotics will play a significant role in this fascinating development.

2. What advances have taken place in the field of regenerative biotechnology? Examine.

Introduction

Regenerative biotechnology is a field of biotechnology that develops tools and therapeutics through modification and engineering of stem cells. It offers hope of effective treatment for a variety of malignant and non-malignant diseases and is useful in development of regenerative medicine.

Body

The sole reliance on transplantation has created a waiting list of people requiring donated tissues and organs, and generally, supply cannot meet the demand. regenerate tissues and in some cases create new tissues altogether. employing both engineering and biological principles to create new tissues and organs and to promote the regeneration of damaged or diseased tissues and organs.

Advancement in regenerative biotechnology:

- Regenerative technology is already being in use for treatment like Bone marrow transplantation to treat diseases like leukemia.
- 3D Bioprinting: have made advancement using regenerative technology in Cartilage regeneration, skin regeneration and organs generation. E.g. scientists were able to generate a fully functional liver using the technology.
- Regenerative cardiovascular therapy: it includes myocardial regeneration using the stem cells. E.g. Recently, scientists were successful in converting stem cells into heart pacemaker.
- Advances in Induced pluripotent stem cells: iPSCs are being transformed into Embryonic stem cells using advanced iPSC technology which can help in organ generation and tissue transformation.
- Researches are progressing in treating neurodegenerative diseases such as Parkinson's, multiple sclerosis and Alzheimer's using regenerative biotechnology. Recently, a novel method for treating Parkinson's using stem cell therapy.
- Embryonic stem cells are giving new insights in motor neuron diseases and advance are being made in regeneration of tissue and treatment of disease in tissue specific manner.
- Regenerative technology is being tested for immune system regeneration
- Potential applications include skin replacement, hair loss treatment, treatment of diabetes and so on which are in the research stages.
- The technology is being used to increase the understanding of how diseases occur by watching stem cells mature into cells in bones, heart muscle, nerves, and other organs and tissue.
- Test new drugs for safety and effectiveness. Before using investigational drugs in people, researchers can use some types of stem cells to test the drugs for safety and quality.

The advancement in the field is associated with certain challenges and risks like

- Ethical issues stem from the use of Embryonic cells which are to be treated as life by themselves.
- Cost can be prohibitive for many patients. It creates further inequality where in the rich will get to live longer as the cost of these therapies are beyond the reach of average human being.
- Unproven treatments often come with high rejection rates. Also, there are concerns of the unintended side effects which are often unpredictable.

- Chances of misuse: using clones which can be used as bioweapons or start a new organ mafia and so on.

Recognizing the potential of regenerative technology, the nations all over the world are investing in its research. Even India has formulated National Guidelines for Stem Cell Research to encourage the same.

Conclusion

A number of diseases and conditions are now being treated via the use of regenerative medicine. The technology is continuously evolving with the innovation in developing biomaterials and use of new technologies like nanotechnology.

3. What do you understand by compulsory licensing in the context of India's IPR legal jurisprudence? What are the associated issues? Analyse.

Introduction

Compulsory licenses are authorizations given to a third-party by the Controller General to make, use or sell a particular product or use a particular process which has been patented, without the need of the permission of the patent owner. This concept is recognised at both national as well as international levels, with express mention in both (Indian) Patent Act, 1970 and TRIPS Agreement.

India's first ever compulsory license was granted by the Patent Office on March 9, 2012, to Natco Pharma for the generic production of Bayer Corporation's Nexavar, a life saving medicine used for treating Liver and Kidney Cancer. Bayers sold this drug at exorbitant rates, with one month's worth of dosage costing around Rs 2.8 Lakh. Natco Pharma offered to sell it around for Rs 9000, making it affordable for people belonging to every stratum.

Body

There are certain pre-requisite conditions, given under sections 84-92, which need to be fulfilled if a compulsory license is to be granted in favour of someone.

As per Section 84, any person, regardless of whether he is the holder of the license of that Patent, can make a request to the Controller for grant of compulsory license on expiry of three years, when any of the following conditions is fulfilled –

- the reasonable requirements of the public with respect to the patented invention have not been satisfied
- the patented invention is not available to the public at a reasonably affordable price
- the patented invention is not worked in the territory of India.

Compulsory licenses can also be issued suo motu by the Controller under section 92, pursuant to a notification issued by the Central Government if there is either a "national emergency" or "extreme urgency" or in cases of "public non-commercial use".

Issues related to Compulsory License

- Creation of Gray Market – In case of compulsory licensing, where the generic company (licensee) is given rights to manufacture and sell the patented drug to the target country only for which the compulsory license is granted but instead, the company itself or its dealers sell the drug to other countries also. Also when compulsory license is granted to some company for manufacture of a certain drug then some other generic companies also start making same drug without any license.

- Difference in standards of National Emergency – no fixed standardized definition of national health emergency is available. Having a fixed, narrow and rigid definition of national emergency which is applicable to all the countries is a twisted task because every country has their own health problems, different diseases, lifestyle and population.

- Apprehensions of the Patent holder – Applicant of compulsory license who has not spent a single penny on the invention cannot be equated with the inventor. Certain patent holders are of the view that compulsory license will dishearten the inventors and will discourage further innovative activities.

- Royalty Free Practice or Low Royalty – it is expected that royalty free grant of compulsory license gives chance to local or small industries to develop and utilize patented invention. This enhances their manufacturing skills and efficiency which is helpful for their future development and that of nation and society as well. But still patentee must be given some royalty as per the agreement.

Conclusion

The main aim of compulsory license is to improve access of public to patented expensive medicines. This also increases the competition in market and cuts down the price of patented drugs, because dominance of a drug in market may lead to high price and hence abuse of patent may result. Moreover TRIPS and Doha Declaration considered compulsory license as an important provision so as to provide health benefits to the people without any discrimination on the basis of color, caste, creed or even country.

4. IPR protection in agriculture is a sensitive topic in India. Do you agree? Substantiate your views.

Introduction

Intellectual property rights (IPRs) can be broadly defined as legal rights established over creative or inventive ideas. Such legal rights generally allow right holders to exclude the unauthorized commercial use of their creations/inventions by third persons.

Body

IPR protection in agriculture is a sensitive topic in India

Agriculture is becoming unsustainable enterprise

- 76% of the farmers would like to quit farming if given a chance (‘***State of Indian Farmers’*** report)
- 86% of the land holding is small and marginal (Agriculture census 2015-16)
- 10 farmers suicide daily (2016, NCRB)
- Non-remunerative price – recently farmers in Shahganj, MP were forced to throw their tomatoes.

Concerns of Extension of IPR to Agriculture

- The traditional rights of the farmers to save, share, exchange and sell the farm produce as well as the seeds might be taken away due to the monopoly extended to the plant breeders by granting IPR on plant varieties.
- Monopoly extended to plant breeders could also raise the price of such commodities.
- The contribution of the farmers in the conservation and preservation of varieties is considered important for further plant breeding. But, due to extension of IPR to agriculture, this invaluable contribution of farmers might not recognise.

Need of more technological intervention

- ‘Farming 3.0’ and evergreen revolution
- E-NAM - National Electronic Platform and other electronic interventions.
- GM crops and food security
- Organic farming

Balancing Corporate Breeder’s and Farmer’s Right

Balancing these two is a challenging task. For instance recently PepsiCo's sued nine Gujarat farmers for alleged infringement of its intellectual property rights (IPR) over a proprietary potato variety makes for bad optics, bordering on a public relations disaster.

Unlike other realms of IP, the biological realm is self-propagating. The technology of propagation is not external but internal to the plant system. Therefore, it is never rational for a farmer to pay a second time for something he has already bought and still possesses in the form of his seed crop. This creates a barrier for full commodification and monopoly profits. So, in order to prevent free replication of seeds, IP law creates enclaves of prohibition and protection, making the farmer's natural right to save, re-use and sell seeds illegal in many countries.

Recognizing the bias in international law, the Indian Protection of Plant Varieties and Farmers' Rights (PPV&FR) entitles not just the breeder but also the farmer. has provision of Farmers' privilege –

- A farmer can produce using any seed protected under the PPV&FR Act, 2001 (section 39)
- Not entitled to sell branded seeds.
- Compensation to the farmers for non-performance of variety.
- Protection to farmer if he is ignorant of legal provision.

Conclusion

While the private sector is growing, farmers are also being promoted to maintain their rights to conserve, use and further develop their plant genetic resources. In this way, India is providing the world, emerging economies and developing countries in particular, with a viable alternative that balances the private sector's and farmers' rights.

5. What do you understand by Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement? What are its implications for India? Explain with the help of suitable examples.

Introduction

The TRIPS Agreement, which came into effect on 1 January 1995, is to date the most comprehensive multilateral agreement on intellectual property. The areas of intellectual property that it covers are: copyright and related rights (i.e. the rights of performers, producers of sound recordings and broadcasting organizations); trademarks including service marks; geographical indications, including appellations of origin; industrial designs; patents including the protection of new varieties of plants; the layout-designs of integrated circuits; and undisclosed information including trade secrets and test data.

Body

- The TRIPs (Trade Related Intellectual Property) regime has emerged as the basic framework for ensuring intellectual property rights across the world. It is not the universal Intellectual property law. But it provides a basic framework. Every member of WTO should include TRIPs provisions in their domestic intellectual property legislations.
- The three main features of the Agreement are:
- Standards- In respect of each of the main areas of intellectual property covered by the TRIPS Agreement, the Agreement sets out the minimum standards of protection to be provided by each Member.
- Enforcement. The second main set of provisions deals with domestic procedures and remedies for the enforcement of intellectual property rights. The Agreement lays down certain general principles applicable to all IPR enforcement procedures.
- Dispute settlement. The Agreement makes disputes between WTO Members about the respect of the TRIPS obligations subject to the WTO's dispute settlement procedures.
- The intellectual property rights regime of the country has been modified by a number of legislation since 1995. For India, the WTO's TRIPs agreement became binding from 2005 onwards as the country has got a ten-year transition period (1995-2005) to make the domestic legislation compatible with TRIPs.
- Here, India has got additional five-year transition period because of not having product patent regime in critical sector like pharmaceuticals. Hence, existing laws were amended and fresh legislations were introduced during this period.
- Different amendments to the various existing Acts- Patent Amendment Act (2005), the Copyright Amendment Act (2010), were made to strengthen domestic legal framework to fulfill the harmonization with the WTO's TRIPS agreement. Similarly, a number of fresh legislations were made to upgrade the country's intellectual property regime.
- Among all the provisions of the WTO agreement, the one relating to Trade Related Intellectual Property Rights (TRIPs) has possibly been the most widely debated in the country. There are reasons why this has been so.
- First, because provisions in TRIPs relate to the country's Patent Laws and have a very serious bearing on major areas of the country's well being – health, agriculture, research, etc.
- Second, because India has been particularly fortunate among all developing countries in having a very liberal Patents regime since 1970 that promoted the country's interests.
- Third, because in the initial stages of the "Uruguay Round" of negotiations under the aegis of the then General Agreement on Tariffs and Trade (GATT), which finally led to the formation of the World Trade Organisation (WTO), India had been extremely vocal in opposing the inclusion of Patent laws in the negotiations.

- India moved from a process patent system to a product patent system in 2005. The patent law is one of the seven intellectual property laws protected under this agreement. Product Patent is the granting of patent to the 'final' product irrespective of the process used for obtaining the product. Once you obtain a patent on the product, then one is precluded from manufacturing that product, even though with a different process.3
- The existence of process patents under the 1970 Indian Patents Act resulted in a robust growth of domestic pharmaceutical industry in India. At the same time, history also shows a decline in the business of foreign pharmaceutical companies in India.
- With the coming of the TRIPs Agreement, disputes have arisen with regard to the protection of pharmaceutical patents. TRIPs does not provide for the retrospective patenting in India of drugs that are already on the market or covered by existing patent applications elsewhere.
- The major changes made in the Indian Patent Act would have significant impact. The market would increasingly become technology driven. Indian firms would have to compete in the new scenario.
- The National Intellectual Property Rights (IPR) Policy 2016 was adopted in May 2016 as a vision document to guide future development of IPRs in the country. It's clarion call is "Creative India; Innovative India".

Conclusion

The major changes introduced in the Indian Patent Act that were required to meet India's obligations to international agreements and treaties. The new Patents Act (Patents Amendment Act 2005) has created a strong patent system in India. Overall the present system has increased the scope of patenting and provides stringent safeguards to the patentee.