

→ GSA - Past Paper Question

Q(a): How does the Navstar GPS system work for different applications? (5)

Navstar GPS System

The Global Positioning System, originally Navstar GPS, is a satellite-based radio navigation system that provides geo-location and time information to a GPS receiver anywhere on Earth. It consists of 24 operational satellites and 8 spare in case of the failure of one.

Applications

The free global availability and accuracy of GPS signals for positioning and timing, has made GPS the preferred solution for a very wide range of civilian applications.

i. Navigation :-

The primary purpose of GPS is navigation. Applications include driving directions, maritime navigation and aviation.

ii- Surveying & mapping:-

Surveyors use GPS to create detailed maps, measure land boundaries and control geodetic surveys.

iii- Geophysics:-

In geophysics, GPS is used to time stamp seismic activity and to monitor position changes in sensitive physical formations such as volcanoes and earthquake fault lines.

iv- Precision Agriculture:-

Farmers use GPS-guided tractors and equipment for precise planting, fertilizing and harvesting.

v- Scientific Research:-

GPS aids in studying Earth's crustal movements, tectonic plate shifts and climate change.

vi- Aviation:-

Pilots use GPS for navigation, approach procedures and landing.

vii. Security:-

Security applications include tracking of vehicles, containers, other valuable cargoes and covert tracking of suspects and terrorists.

viii. Road Transport:-

Based on the number of GPS receivers sold globally, road transport applications are the majority users of GPS positioning.

Q(b): What do you know about remote sensing techniques? Explain resolution and write down the names of various types?

Remote Sensing

" Remote sensing is the science (and to some extent, art) of acquiring information about the Earth's surface without actually being in contact with it. "

Basic components of a remote-sensing system include :

- a target
- an energy source
- a transmission path
- a sensor

Types

Remote sensing can be classified on the basis of source of energy and range of electromagnetic spectrum.

- Passive Remote Sensing
- Active Remote Sensing

Resolution

In image analysis meaningful information is extracted from the imagery. Much interpretation and identification of targets in remote sensing is performed manually or visually, i.e. by human interpreters.

Recognizing targets is the key to interpretation and information extraction.

The most common softwares used in RS are ERDAS Imagine, ESRI, Map-Info, and ERMapper.

Types of Image Resolution

i- Spatial: Spatial resolution refers to the size of the smallest object that can be resolved on the ground.

ii- Radiometric: It is the capacity of the instrument to distinguish differences in light intensity or reflectance.

iii- Spectral: Spectral resolution describes the ability of a sensor to define fine wavelength intervals. The finer the spectral the narrower the wavelength range.

iv- Temporal: The ability to collect imagery of the same area of the Earth's surface at different periods of time is most important element for remote sensing.

Q(c): Differentiate b/w Natural and Artificial satellites. Briefly describe the working of communication satellites with some applications. (5)

Satellite

“A satellite is any object that revolves around a planet in a circular or elliptical path.”

Natural Satellite	Artificial Satellite
“Natural satellites are celestial bodies that orbit planets or other larger astronomical objects.”	“Artificial satellite is a semi independent computer controlled system placed by humans in an orbit for different purposes.”
They are comparatively larger in size	Their distance, size and mass are lesser than natural satellite.

Natural satellites do not have light of their own. They receive light from the sun.

The electrical power required by artificial satellites is provided by panels of solar cells and small nuclear reactors.

The natural satellites cannot communicate on earth or with other planets.

The artificial satellites can communicate with instruments on earth.

The natural satellites is made up of natural material, rock, minerals, water, dust etc.

The artificial satellite is made out of metal and electronics material.

These satellites are natural in space and are not used officially by the scientists.

These are used and controlled by the astronomers and are used upto their will.

The most well known Natural satellite is

The first artificial satellite was

the Earth's moon,

Sputnik I.

A satellite, in today's world has various applications in many fields. Most satellites serve one or more functions like:

- Communications
- Navigation
- Weather forecasting
- Environmental monitoring
- Space exploration satellites
- Remote sensing satellites
- Search and Rescue satellites