

# ISP

2 MARKS

## 1. What is a satellite?

**Satellite** is a microwave repeater in the sky. It consists of a diverse combination of one or more components including transmitter, receiver, amplifier, regenerator, filter onboard computer, multiplexer, demultiplexer, antenna, waveguide etc.

## 2. What is footprint?

The signal from a satellite is aimed at a specific area on earth. This area is called the footprint of the satellite. The footprint of a satellite is dependent upon the distance of the satellite from Earth.

## 3. List few services of satellites

**Satellite services include:**

- Fixed satellite service (FSS)
- Broadcasting satellite service
- Mobile satellite services
- Navigational satellite services
- Meteorological satellite services

## 4. Distinguish PSLV and GSLV

**PSLV** stands for Polar Satellite Launch Vehicle and **GSLV** stands for Geosynchronous Satellite Launch Vehicle.

**PSLV** is used to send satellites to the polar orbits which are to orbit through north-south. PSLV is used to launch earth observing satellites (remote sensing) weather forecasting satellites. The satellites are placed about 800 km above the ground.

**GSLV** is used to send satellites to the higher orbits and also with higher loads. It launches communication satellites to orbit over the equator line through east-west. The satellites are placed about 36000 km above the ground.

## 5. Expand the following

ISP, INCOSPAR, TERLS, SHAR, ISRO, INSAT, IRS, NIC, DOS, METSAT, SITE, STEP, APPLE, EDUSAT, VSAT, SLV, ASLV, GSLV, PSLV, RLV, SSLV, MOM, DTH, IMD, GSAT, NNRMS.

**Answer: students are requested to write the expansion.**

**Hint: you can find them in the study materials of ISP**

**6. What are the operational space systems in India?**

India has established **two** operational space systems, viz. **INSAT system and IRS system.**

INSAT provides services for telecommunications, television broadcasting and meteorology including disaster warning.

IRS system generates information on natural resources.

**7. What is the focus of ISP?**

The focus of the Indian space programme (a) application of space technology as a tool for socioeconomic development of the country, and (b) to achieve 'self-reliance' in this strategic area.

**8. List the types of IRS satellites.**

TYPES OF IRS SATELLITES:

- i) Land/water resources applications Satellites (RESOURCESAT series and RISAT series)
- ii) Ocean/atmospheric studies Satellites (OCEANSAT series, INSAT-VHRR, INSAT-3D, and SARAL) and
- iii) Large scale mapping applications Satellites (CARTOSAT series).

**9. Mention few applications of IRS satellites.**

IRS satellites find application in the following fields.

- ISRO Disaster Management Support Programme (ISRO-DMSP)
- Drought monitoring and assessment.
- Flood risk zone mapping and flood damage assessment.
- Urban planning

- Forest survey
- Mineral Prospecting

### **10. Define GIS.**

GIS is a systematic integration of computer hardware, software, and spatial data, for capturing, storing, displaying, updating, manipulating and analyzing in order to solve complex management problems. GIS is a facility for preparing, presenting & interpreting (understanding) facts that pertain (related) to the surface of the earth.

### **11. Why do clouds represent a source of heat for the atmosphere?**

Clouds warm the earth's atmosphere by absorbing heat emitted from the surface and radiating it to space. Clouds cool the earth surface by reflecting incoming sunlight.

### **12. When will freezing rain happen?**

When rain drops fall through a cold layer of air (cooler than  $0^{\circ}C$  or  $32^{\circ}F$ ) and become supercooled, freezing rain occurs.

### **13. Mention few applications of GIS.**

GIS and Remote Sensing are used in the following fields

1. Agriculture and soils
2. Ocean resources
3. Forestry and environment
4. Major river valley projects
5. Natural resource based applications.

### **14. What are the functions of Antrix Corporation?**

**Antrix Corporation** is the commercial arm of ISRO under the Department of Space.

- i) It facilitates development of space related industrial capabilities in India.

- ii) It hosts consultancy and training services
- iii) It handles ISRO's commercial deals for satellites and launch vehicles with foreign customers.
- iv) It plays a pivotal role in delivering space systems and services that meet the expectations of leading global organizations.
- v) It facilitates the utilization of Indian space assets in the field of telecommunications and broadcasting including TV feed, DTH, VSAT, mobile communications Telemedicine and Teleeducation.

**15. List the various types of Launching vehicles.**

**LAUNCHING VEHICLES**

- 1) Sounding Rockets
- 2) SLV – Satellite Launch Vehicle
- 3) ASLV – Augmented Satellite Launch Vehicle
- 4) PSLV – Polar Satellite Launch Vehicle
- 5) GSLV – Geosynchronous Satellite Launch Vehicle
- 6) RLV – Reusable Launch Vehicle
- 7) SSLV - Small Satellite Launch Vehicle

**16. TYPES OF SATELLITES (EACH 2 MARK)**

**1. WEATHER SATELLITES OR METEOROLOGICAL SATELLITES**

Certain satellites are specifically designed to monitor the climatic conditions of earth. They continuously monitor the assigned areas of earth and predict the weather conditions of that region. This is done by taking images of earth from the satellite. These images are transferred using assigned radio frequency to the earth station. These satellites are exceptionally useful in predicting disasters like hurricanes, and monitor the changes in the Earth's vegetation, sea state, ocean color, and ice fields.

**2. COMMUNICATION SATELLITES**

A communication satellite is specifically made for telecommunication purpose. It is a microwave repeater station in space that is used for telecommunication, radio and television signal. It supports telecommunication, television broadcasting, satellite news gathering, societal applications, weather forecasting, disaster warning and Search and Rescue operation services.

### **3. MILITARY SATELLITES**

These satellites are often used for gathering intelligence, as a communications satellite used for military purposes, or as a military weapon. A satellite by itself is neither military nor civil. It is the kind of payload it carries that enables one to arrive at a decision regarding its military or civilian character.

### **4. NAVIGATION SATELLITES**

Satellites for navigation services to meet the emerging demands of the Civil Aviation requirements and to meet the user requirements of the positioning, navigation and timing based on the independent satellite navigation system. Ships and aircraft rely on GPS as an addition to traditional navigation systems.

### **5. GLOBAL MOBILE COMMUNICATION**

The basic purpose of satellites for mobile communication is to extend the area of coverage. With the integration of satellite communication the mobile phone can switch to satellites offering world-wide connectivity to a customer.

### **6. EARTH OBSERVATION SATELLITES**

The series of satellites supporting multitude of applications in the areas of land and water resources; cartography; and ocean & atmosphere are called Earth Observation satellites. Indian IRS is the largest civilian remote sensing satellite constellation in the world

### **7. SCIENTIFIC SPACECRAFT**

Spacecraft for research in areas like astronomy, astrophysics, planetary and earth sciences, atmospheric sciences and theoretical physics.

### **8. EXPERIMENTAL SATELLITES**

A host of small satellites mainly for the experimental purposes. These experiments include Remote Sensing, Atmospheric Studies, Payload Development, Orbit Controls, recovery technology etc.

#### **9. SMALL SATELLITES**

The satellites which are sub(below) 500 kg class satellites - a platform for stand-alone payloads for earth imaging and science missions within a quick turnaround time.

#### **10. EDUCATIONAL SATELLITES**

The communication satellites which are launched exclusively for educational services are called educational satellites. Ex. EDUSAT

#### **17. TYPES OF ORBITS (EACH 2 MARK)( ALSO USEFUL FOR UNIT 5)**

##### **1. GEOSTATIONARY OR GEOSYNCHRONOUS EARTH ORBIT (GEO)**

GEO satellites are synchronous with respect to earth. Looking from a fixed point from Earth, these satellites appear to be stationary. The satellite should be placed 35,786 kms (approximated to 36,000 kms) above the surface of the earth. These satellites must travel in the rotational speed of earth, and in the direction of motion of earth, that is eastward.

These satellites are used for TV and radio broadcast, weather forecast and also, these satellites are operating as backbones for the telephone networks.

##### **2. LOW EARTH ORBIT (LEO) SATELLITES:**

These satellites are placed 500-1500 kms above the surface of the earth. As LEOs circulate on a lower orbit, hence they exhibit a much shorter period that is 95 to 120 minutes to complete the revolution. LEO systems try to ensure a high elevation for every spot on earth to provide a high quality communication link. Smaller footprints of LEOs allow for better frequency reuse, similar to the concepts used for cellular networks. These satellites are mainly used in remote sensing and providing mobile communication services.

##### **3. MEDIUM EARTH ORBIT (MEO) SATELLITES:**

MEOs can be positioned somewhere between LEOs and GEOs, both in terms of their orbit and due to their advantages and disadvantages. Using orbits around 10,000 km, the system only requires a dozen satellites which is more than a GEO system, but much less than a LEO system to cover the entire earth. These satellites move more slowly relative to the earth's rotation allowing a simpler system design (satellite periods are about six hours). Depending on the inclination, a MEO can cover larger populations, so requiring fewer handovers.

#### **4. SUN- SYNCHRONOUS ORBITS SATELLITES:**

These satellites rise and set with the sun. Their orbit is defined in such a way that they are always facing the sun and hence they never go through an eclipse. For these satellites, the surface illumination angle will be nearly the same every time.

#### **5. HOHMANN TRANSFER ORBIT:**

This is an intermediate orbit having a highly elliptical shape. It is used by GEO satellites to reach their final destination orbits. This orbit is connected to the LEO orbit at the point of perigee forming a tangent and is connected to the GEO orbit at the point of apogee again forming a tangent.

#### **6. POLAR ORBITS**

Polar orbiting satellites orbit the earth in such a way as to cover the north and south Polar Regions. Whereas there is only one geostationary orbit, there are, in theory, an infinite number of polar orbits. The polar orbits are almost circular and are at a height of between 800 and 900 km above earth. These (polar) orbits are sun synchronous, meaning that they cross the equator at the same local time each day.

The polar orbiters are able to track weather conditions over the entire earth, and provide a wide range of data, including visible and infrared radiometer data for imaging purposes, radiation measurements and temperature profiles.

## ESSAY TYPE QUESTIONS

- 1) Analyse the achievements of ISP.
- 2) Describe the methodological issues in cost beneficiary analysis in space programme.
- 3) Explain how INSAT systems are useful in broadcasting.
- 4) Explain how INSAT systems are useful in telecommunication.
- 5) Explain how INSAT systems are useful in meteorology.
- 6) Discuss the achievements of IRS systems.
- 7) Describe the basics of GIS.
- 8) Explain ISRO's launching programs.