Test - 1 (GSA)

Question 2

(A)

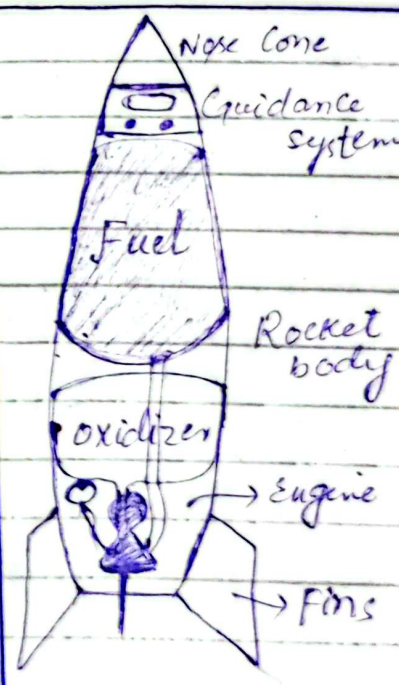
How a satellite is launched? Define the working principle of GPS.

1. Defining Satellite

A satellite is any object that revolves around a planet in a circular or elliptical path. For instance, moon is a natural satellite of the Earth.

2. How satellites are launched

Rockets launch satellites into orbits high above the Earth. Earth's gravity provides a necessary centripetal force to keep satellite in the orbit. The launching process involves attaching satellite to rocket, which is then launched vertically to pass through the atmosphere. At a certain height, rocket tilt its path to achieve necessary orbital velocity. The final stage releases the satellite to begin its operational phase.



• Structure of Rocket

3- Working Principle of GPS

Global positioning system is a satellite-based navigation system that provides real-time location, speed and time data essential for tracking, routing, and optimizing fleet operations. The fully operational GPS system consists of 24 satellites.

GPS works through a technique called trilateration. This steps of process are shown as:

- Satelite orbiting the Earth send signals to be read & interpreted by GPS

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Each satelite in network circles the Earth & sends a unique signal, orbital parameters & time

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A single satellite broadcasts a microwave signal which is picked by GPS device and used to calculate distance from GPS device to satellite

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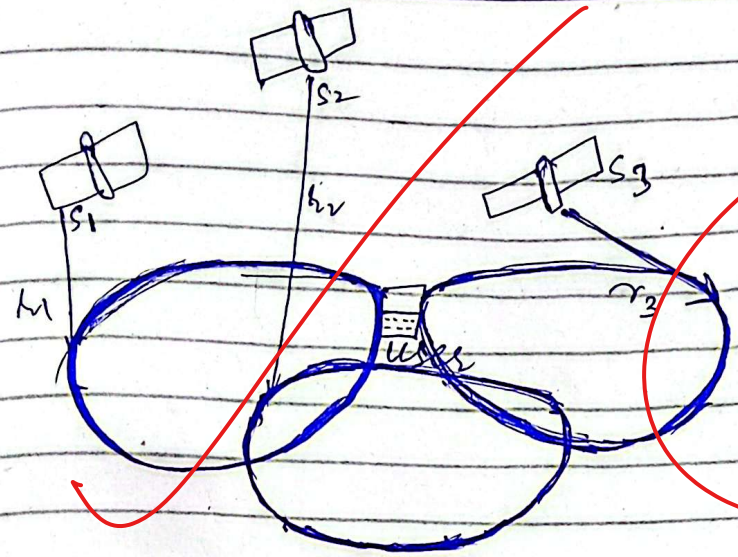
After adding a second and third satellite, device's location can be finally determined.



• Trilateration process

(B)

What is Optical Fiber? Explain the working principle of optical Fiber

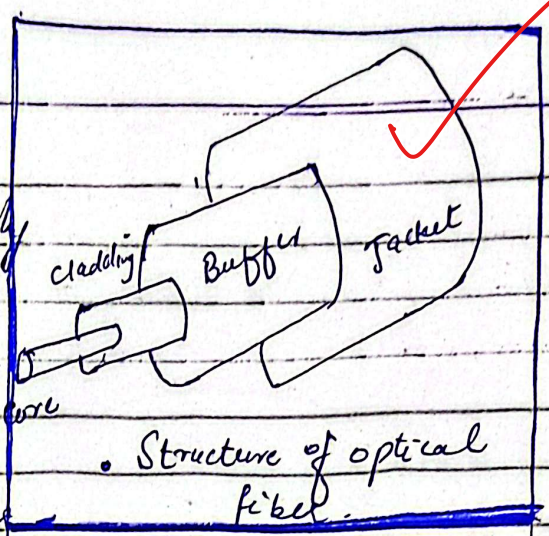
1- Defining Optical Fiber

Optical fiber refers to the technology associated with the transmission of information as light pulses along a hollow glass tube or plastic wire or fibre.

2- Structure of fiber optic

An optical fiber consists of four parts:

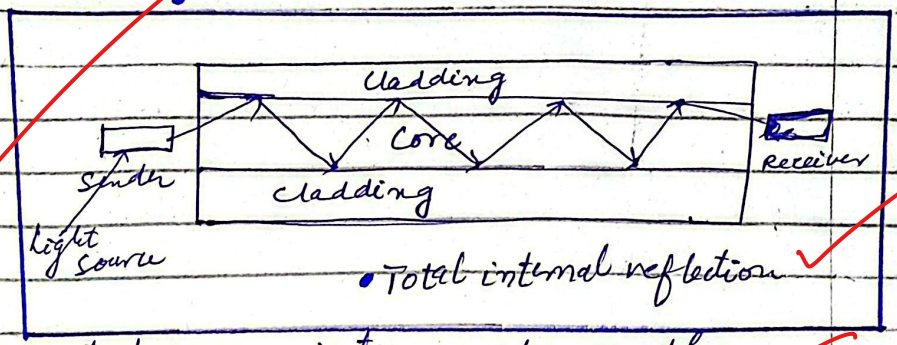
(i) Core
(ii) Cladding
(iii) Coating or buffer
(iv) Extra Jacket.



• Structure of optical fiber.

Light propagates mainly along the core of the fiber. The core is generally made of glass. The core is surrounded by a layer of material called cladding. Cladding reduces loss of light and prevents scattering loss. For extra protection and to prevent fiber from mechanical damage, cladding is enclosed in buffer. Fiber optic cable's jacket makes us recognize exact mode of fiber (e.g yellow color signifies single mode cable).

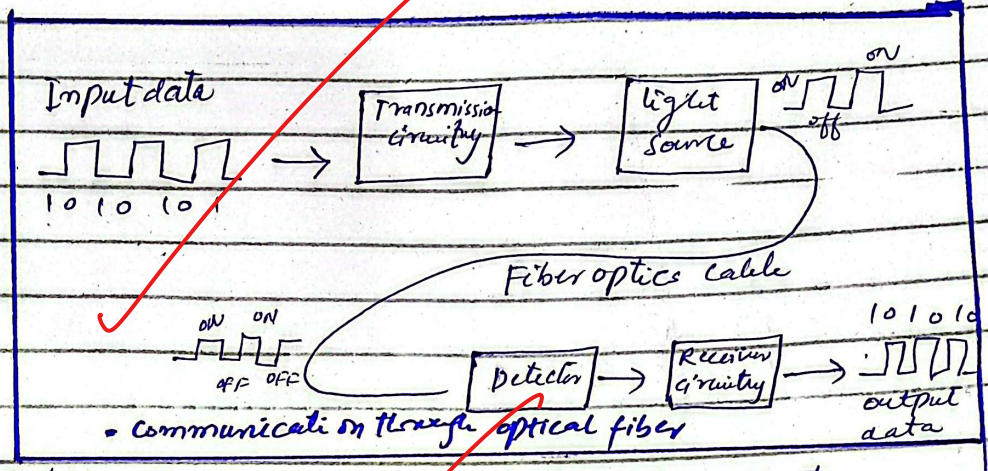
Working of optical Fiber



• Total internal reflection

Fiber optical communication works on the principle of total internal reflection. When the input data, in the form of electrical signals, is given to transmission circuitry, it converts them into light signal with the help of light source, which is LED source. The light beam from light source is carried by a fibre optic cable to the destination circuitry wherein

the information is transmitted back to the electrical signal by a receiver circuit.



The receiver circuit consists of a photo detector along with an electronic circuit, which is capable of measuring magnitude, frequency, and phase of optic field.