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Internal Assesment Test - III

Sub:	Satellite Communication							Code:	18EC732
Date:	03/ 01/ 2024	Duration:	90 mins	Max Marks:	50	Sem:	7th	Branch:	ECE
Answer Any FIVE FULL Questions									

		Marks	OBE	
			CO	RBT
1.	Define transponder. Explain the types of transponder used in communication satellites.	[10]	CO4	L2
2.	With neat sketch explain VSAT topology and VSAT network.	[10]	CO4	L2
3.	Write notes on Satellite Telephony and Satellite TV.	[10]	CO4	L2

PTO

CCI HoD

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4	Explain with basic block diagram the elements of a satellite communication system.	[10]	CO4	L2
5.	With suitable sketch explain the GPS system. Explain the navigation techniques employed with GPS. Discuss the signal structure of navigation system.	[10]	CO5	L3
6.	Explain the working of weather forecastiong satellite with emphasis on payloads and orbits.	[10]	CO5	L2
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14. Define Transponder. Explain the types the of transponder used in communication satellite.

⇒ Transponder: Transponder is a on-board device that basically peforms amplitude and frequency variations is known as transponder.

⇒ There are two types of transponder

i) Transparent / bent pipe transponder

ii) Regenerative transponder.

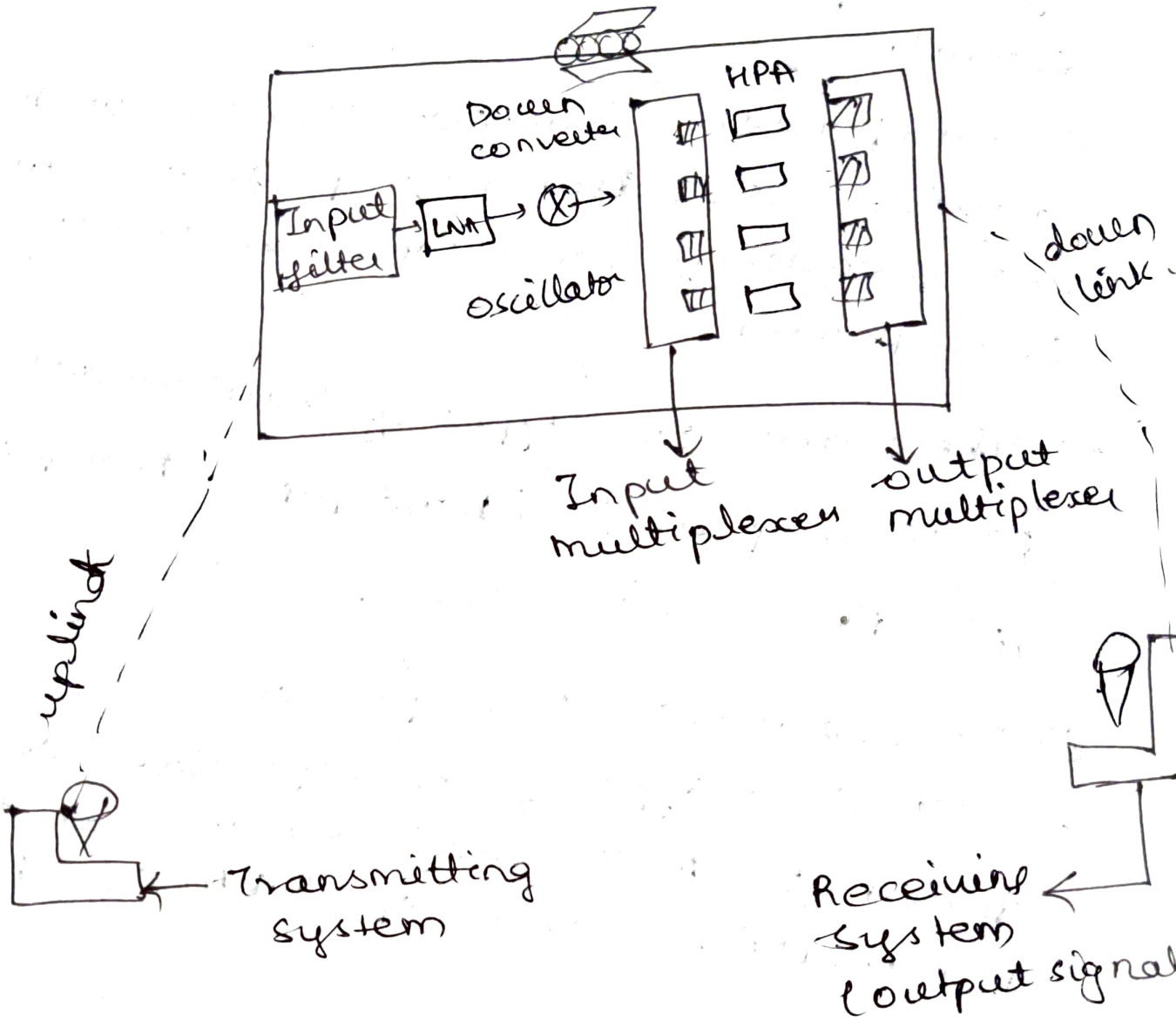
i) Transparent transponder.

⇒ It is a type of transponder that doesnot make any changes in the modulation and spectrum of the signal

⇒ It only changes the amplitude and frequency of the signals.

⇒ The figure for Transparent transponder is shown in next page.

⇒



⇒ The Transparent transponder consists of uplink, input filter, LNA [low Noise amplifier], Downconverter, Input multiplexers and HPA [High Power amplifier] and output multiplexers,

* Regenerative Transponder

⇒ It is a type of transponder that basically changes the modulation properties of the signals that are received by the input signals.

⇒ It also changes the spectral properties of the received signal.

⇒ It makes these above mentioned changes and then sends it to the receiving system.

⇒ Regenerative transponders have various advantages like error correction, increased throughput, improved efficiency. etc

⇒ It is widely used because of this property.

Q2. VSAT Topology and VSAT network.

⇒ VSAT Topology

⇒ VSAT stands for Very Small Aperture Terminals [VSAT].

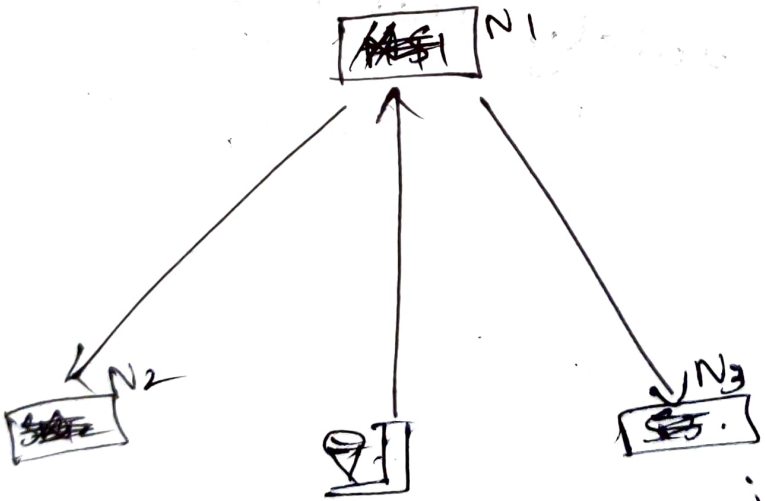
⇒ This VSAT basically used for one to one, one to many broadcasts etc.

⇒ The VSAT uses the topology like star and mesh.

⇒ Star is used for both unidirectional and bidirectional

⇒ Whereas Mesh is used for bidirectional.

⇒ Star unidirectional

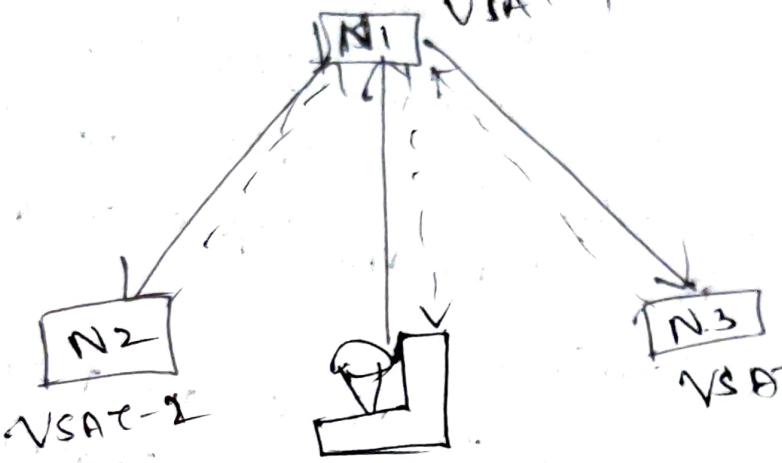


⇒ As the name explains, it is uni-directional. That means it is one-way

communication, anyone device sends the information at a time.

⇒ No two devices can send and receive at the same time.

* Star topology bidirection

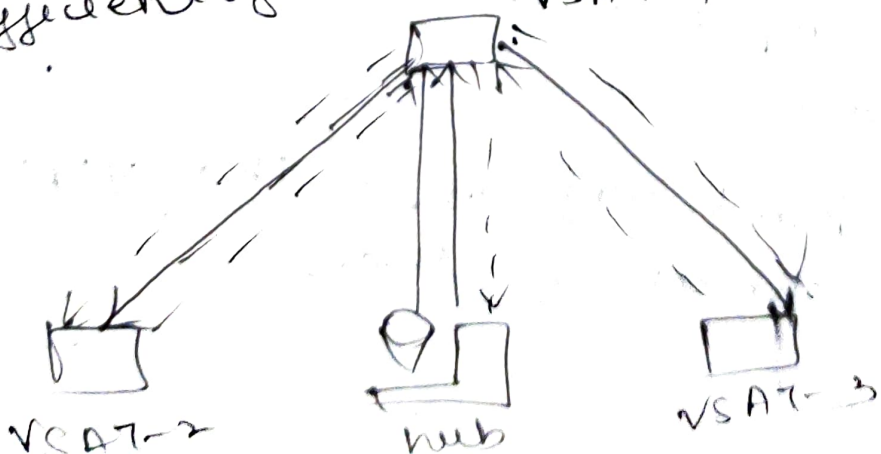


⇒ As the name suggests it is bidirection -al, that means it can send and receive the data at the same time.

⇒ It is like dual two way communi -cation.

* Mesh topology bidirection

⇒ It is also two way, it is more efficiently used.



* VSAT - Network.

⇒ VSAT stands for Very Small Aperture Network (VSAT)

⇒ It is basically used for the point to point audio communication, one to one video communication, one to many image communication.

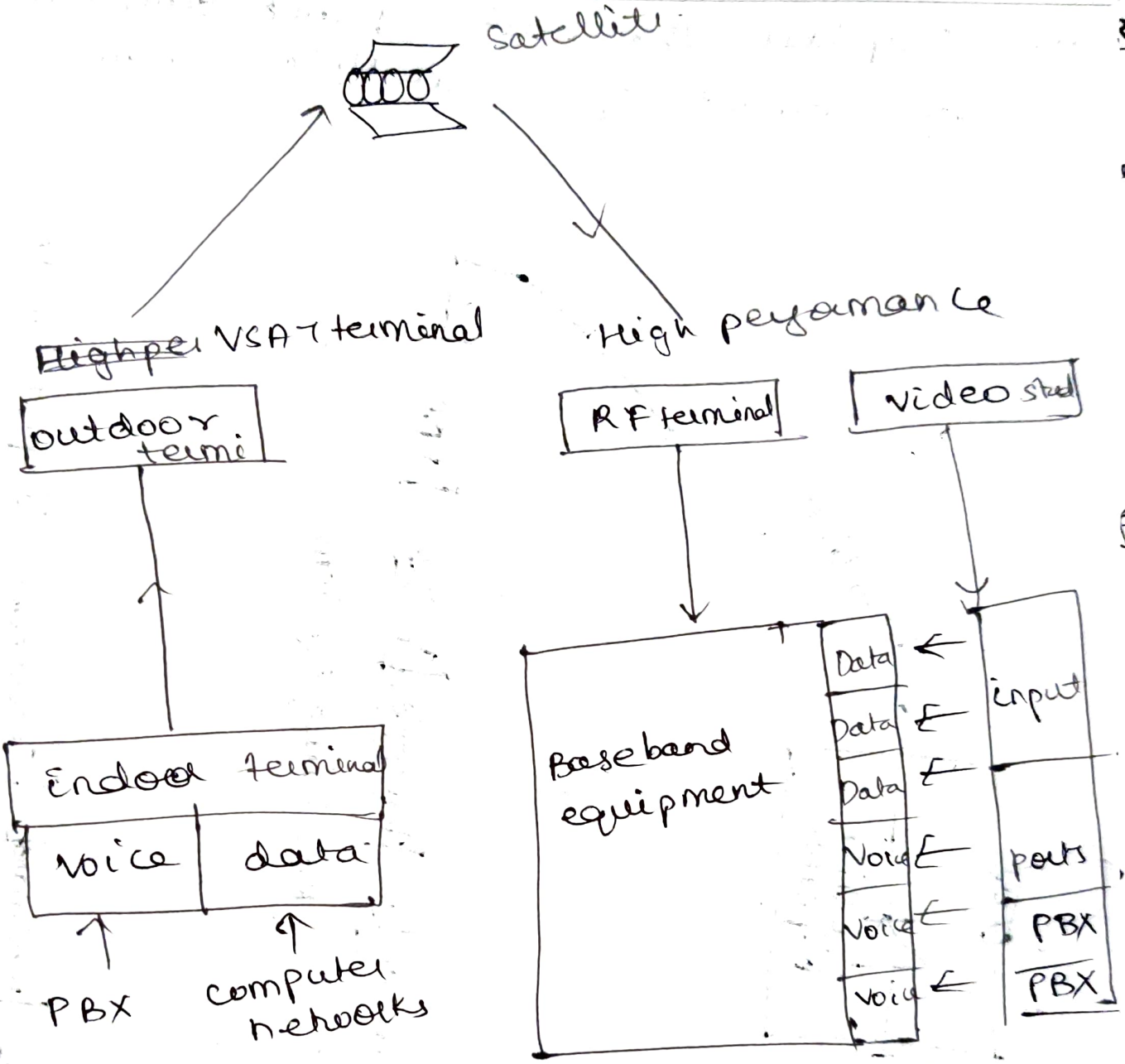
⇒ It basically acts like a central network that has multiple dispensed networks / terminal.

⇒ Example: It is like a Bank (Head office) and branches (terminals) that are present all over.

⇒ VSAT network basically consists of a high peformance hub Earth station and the low peformance terminals.

⇒ One high peformance hub earth station is present to make the network more simple, flexible and easy to install.

⇒ The Block diagram for the VSAT-network is shown further.



⇒ The space segment basically is a GEO satellite.

⇒ GEO satellite is present between the ant. High performance hub and the terminals.

4. Explain the basic block diagram of elements of a satellite communication

⇒. The Basic block diagram for the elements of a satellite is shown.

⇒. The basic outlook of a satellite communi-cation is

→ Transmitting system
→ satellite
→ Receiving system.

⇒. In Transmitting system is basically consists of → Encoder
→ Modulator
→ Up-convertor
→ HPA
→ Earth station

⇒ So the input signals when fed into the Transmitting system it is first encoded.

⇒ Then the signal is modulated

⇒ Then the signal's frequency / amplitude is changed / varied according to requirement.

⇒ Then it is send through HPA [High power amplifier] to increase the amplitude.

⇒ With the help of uplink it is sent to the satellite.

⇒ The satellite part consists of satellite repeater.

⇒ Then now the satellite starts retransmitting the signals that it received.

⇒ It passes through down-link.

⇒ Then it is sent to Low Noise amplifier

⇒ Then it is sent through Down converter to retrieve back the signal without any error

⇒ Then earlier it was modulated; so now a demodulator is used to demodulate the signal

⇒ Then through decoder the transmitted signals are received by the receiver.

⇒ This is the overall operation of satellite communication.

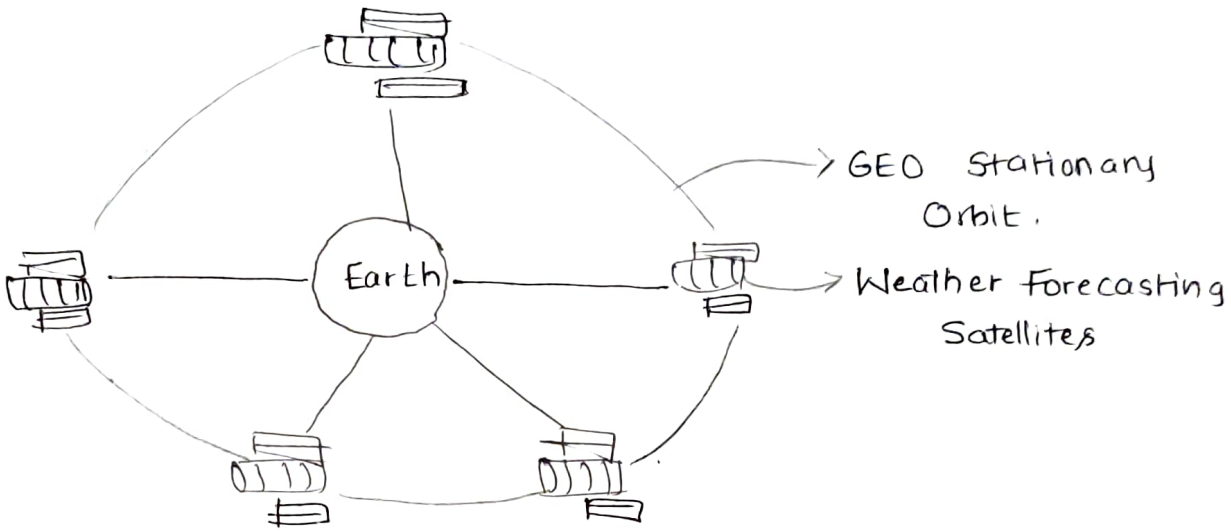
immediately.

6) * Weather forecasting satellite with emphasis on payloads and Orbits :

i) Orbits : - There will be two different types of orbits present in the space for the weather forecasting satellites.

- The weather forecasting satellites can be placed in any of the orbits.
- The two different orbits are the polar orbits and the Geostationary orbits.
- Polar orbits are present near the polar regions only.
- They will be covering the information of the regions near the polar areas itself.
- Mostly these satellites are preferred to be placed in the Geo Stationary Orbits.
- There will be many satellites in the Geo Stationary Orbit compared to that of the Polar orbits.

- Geostationary Orbits are mostly preferred because they can cover wide range when compared to that of the polar orbits.
- These weather forecasting satellites are present around the earth in the Geostationary Orbit.



ii) Payloads :- There will be some instruments or the equipment that are placed on the satellites to get the information.
- These equipment like telescopes, translators, etc are referred to as payloads on the satellites.
- These will be helpful for getting the information from the surface of the earth.
- To capture the visible and IR images also these payloads will be helpful.
- Mainly these payloads includes the transcuders which will help to convert the signals into the working or the feasible range.

7c. Explain the military and civilian applications of satellite navigation.

⇒ Satellites are the bodies that revolve around the earth and provides information that are very accurate without even having a physical contact with the surface.

⇒ It plays a very important role in satellite navigation system.

⇒ It has wide range of application in military purpose as well as civilian purpose.

* Military

⇒ satellites are basically a invaluable thing / matter to the soldiers

i) Navigation

⇒ It is used to track the location / accer the location of the enemy parties by the soldiers

⇒ It can be used both in day and night time.

→ It can be used instead of compass as compass does not show direction at night due to absence of sunlight.

* Tracking.

→ They can track the data that can be used as an input to missile, smart bombs etc.

→ As the satellite ~~co~~ gives accurate values.

* Rescue.

→ It is used to rescue the people / equipment that were trapped by the enemy / opposite parties.

* Mapping.

→ It is used for mapping the data.

→ It can also be used for updation of the map as well.

~~* Military purpose~~

*Civilian purpose

i) Construction

⇒ By civilians it is used for construction of the buildings.

ii) Rescue people.

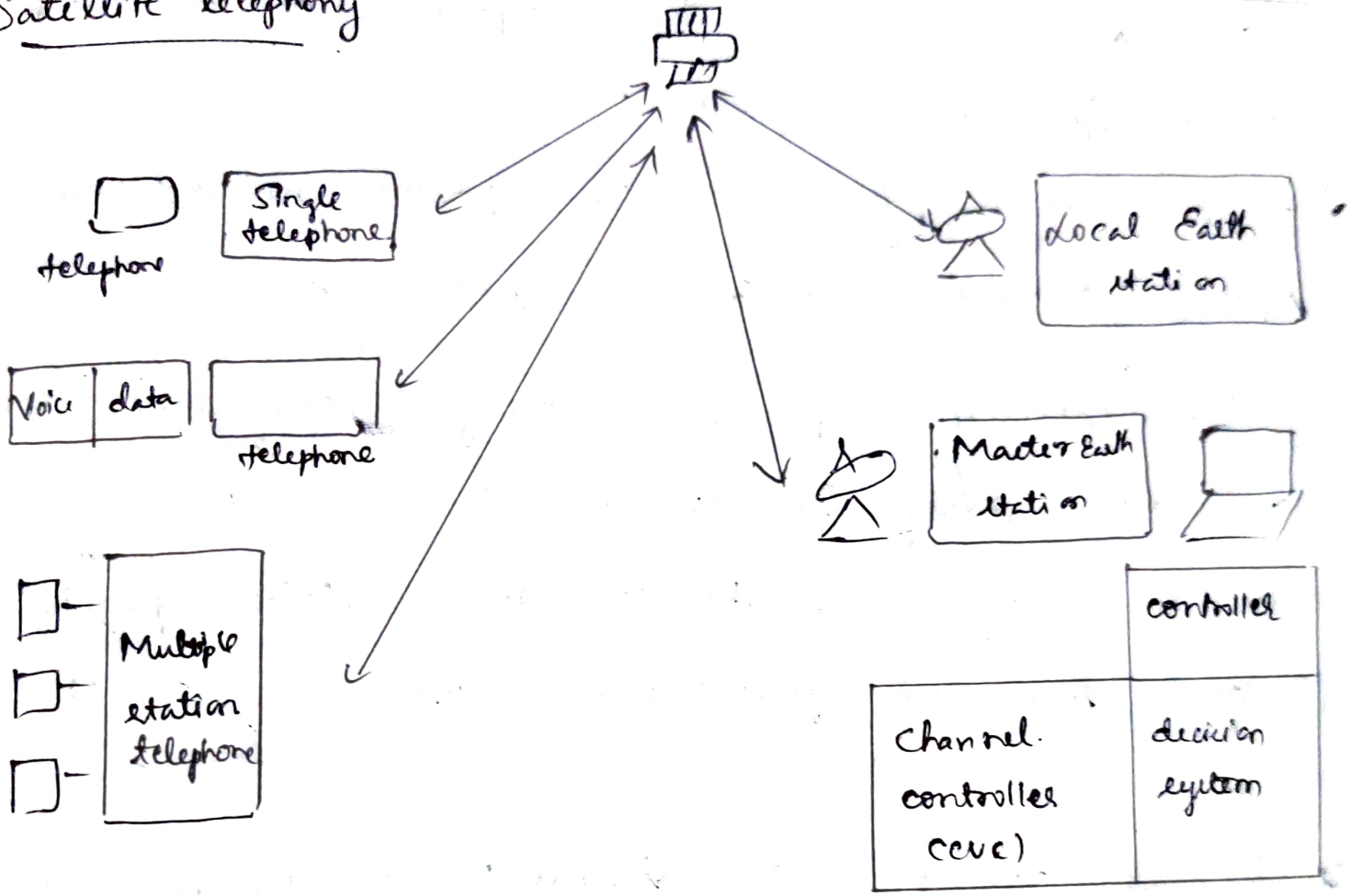
⇒ It is used to find the kidnapped people by sensing the latitude & longitude of their cellphone / mobile.

iii) Data collection

⇒ It is used for data collection that can be used to find location.

iv) We can also easily find / track the person movements. Once the latitude and longitude is found we can easily get their live location.

Satellite telephony

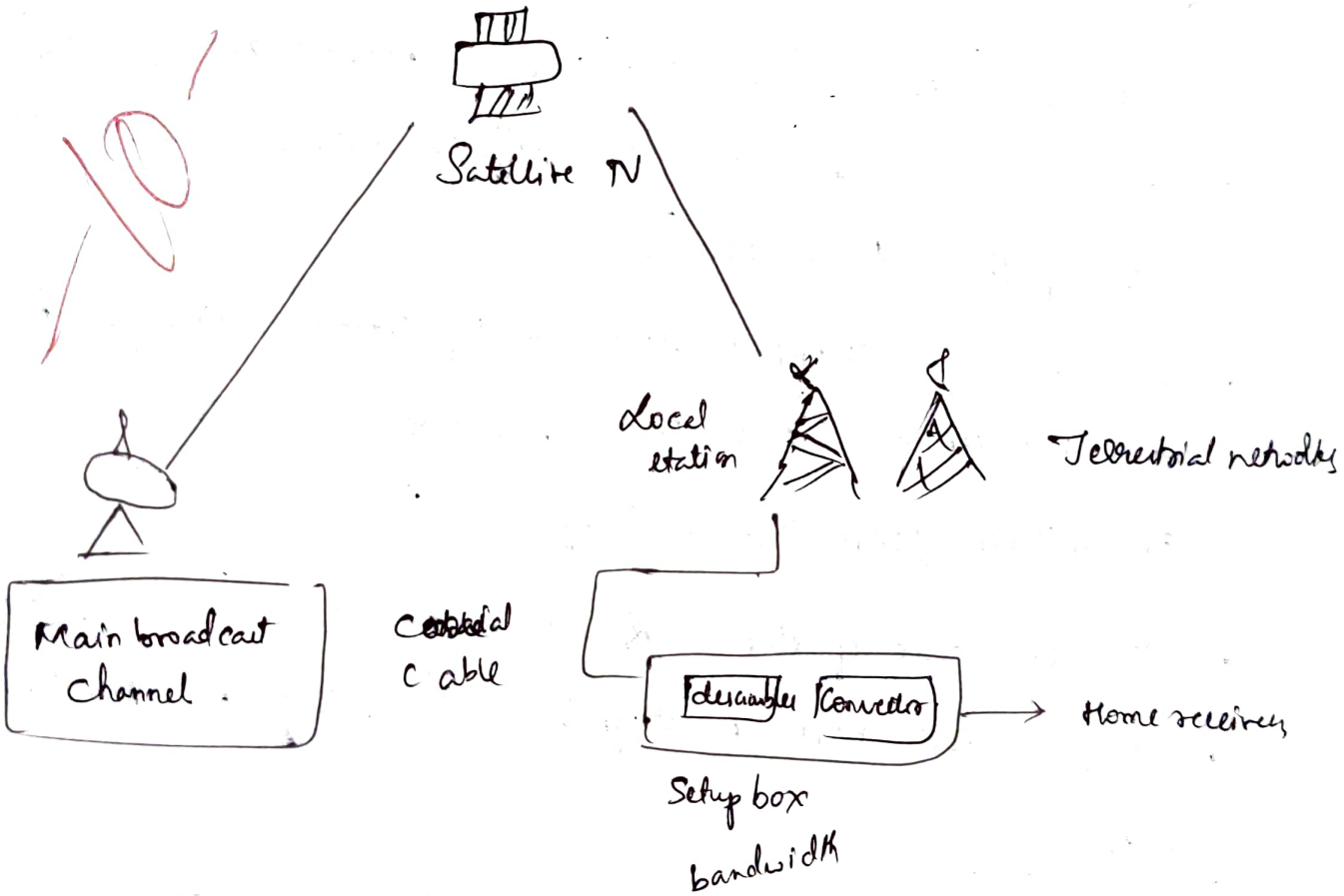


- Satellite telephony communication can be point to point communication & the multipoint communication
- Satellite telephony is a circuit based system in which the communication is full-duplex.
- When the person wants to place a call takes up the receiver which send the signal to local station.
- In turn the local station sends the signals to the Master station
- The Master station checks for the availability of the satellite capacity, in which it sends the acceptance as the deep sound can be hear by the person.
- After dailing the destination person number the destination party gets the call as the phone rings.
- The satellite capacity is assigned only when the destination party receives the calls.
- Once the party receives the call the satellite capacity is assigned then the persons can communicate in the two way
- Once the call ends or disconnects to notify the remove the assigned link.
- Later the assigned capacity is removed now the satellite is free to assign the others call

(6) Satellite TV

- Satellite television is used for the Relay of the TV programs from the main broadcast channel to other terrestrial networks
- The first satellite for Television purpose introduced is Sky.
- There are different kind of satellite Television used for the different transmissions like cable satellite television, Direct broad cast television, Direct to-Home television etc.
- In the cable satellite television the network the optical fibre & coaxial cable. to broadcast to different network, which also consists of the Head terminal.
- The satellite HotBird installed by ~~installed~~ Europe has around 900 satellite tv and 450 satellite Radio service around 94 million people in the Europe
- In the case of the Direct broad cast (DBS) television which uses the DTH & setup boxes to deliver to the terrestrial network.
- The setup box contains the descambles and converter inside
- In some of satellite the other strong and terrestrial antennas are used to receive the signal from the satellite.

- In direct to home the Main broadcast channel transmits to to satellite, then from there to directly to the home received
- In the cable television each transponder in side onboard satellite can provide 5 channels so as many repeaters are there can provide 200 channels per the satellite



- These satellite cover the wide area so it to possible to covers wide geographical area.
- The satellite are placed in GEO orbits & in the constellation of MEO, GEO, LEO orbits