Code No: RR410406 **Set No. 1**

**IV B.Tech I Semester Regular Examinations, November 2005**
**SATELLITE COMMUNICATIONS**
**( Common to Electronics & Communication Engineering and Electronics & Telematics)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. Explain in detail the space and ground segments of a satellite communication network. [16]

2. (a) Draw and geometry of a geostationary link showing elevation, azimuth and range. [8]
   (b) A geostationary satellite moving in an equatorial circular orbit is at a height of 35786 km. from the earths surface. If the earth radius is taken as 6378 km, determine the theoretical maximum coverage angle and maximum slant range. [8]

3. (a) Explain in detail about tracking subsystem with neat block diagram. [8]
   (b) What is doppler effect? Explain how is it useful for tracking. [8]

4. (a) Why blue light sensitive solar cell are preferred for power generation at satellite. [6]
   (b) Explain various ways by which electrical power is generated for its operation. [10]

5. (a) Define Noise temperature. How it is used to calculate noise power and derive an equation for C/N ratio for the antenna delivering a power $P_r$ to the receiver with a IF gain of the receiver G(G is a ratio). [8]
   (b) Calculate the system noise temperature of the earth station receiver shown, assuming appropriate factors as shown in figure1 [8]

6. Explain the Frequency Division Multiple Access of Satellite System with one example. [16]

7. (a) A 14/11 GHz antenna has a G/T ratio of 40.3dB at 11.2 GHz. The antenna gain is 64dB and the system noise temperature at 10 deg elevation angle in clear air conditions is 234k. The antenna aperture efficiency and noise temperature are detailed in the list below. During heavy rain, the slant path attenuation reaches 8dB for 0.01 percent of the year. Calculate G/T ratio for their fraction of the year and the corresponding reduction in C/N for the received signal. [10]
   Aperture efficiency: 71.3%
   Sky noise at 10deg elevation: 30k
   LNA noise temperature: 150k

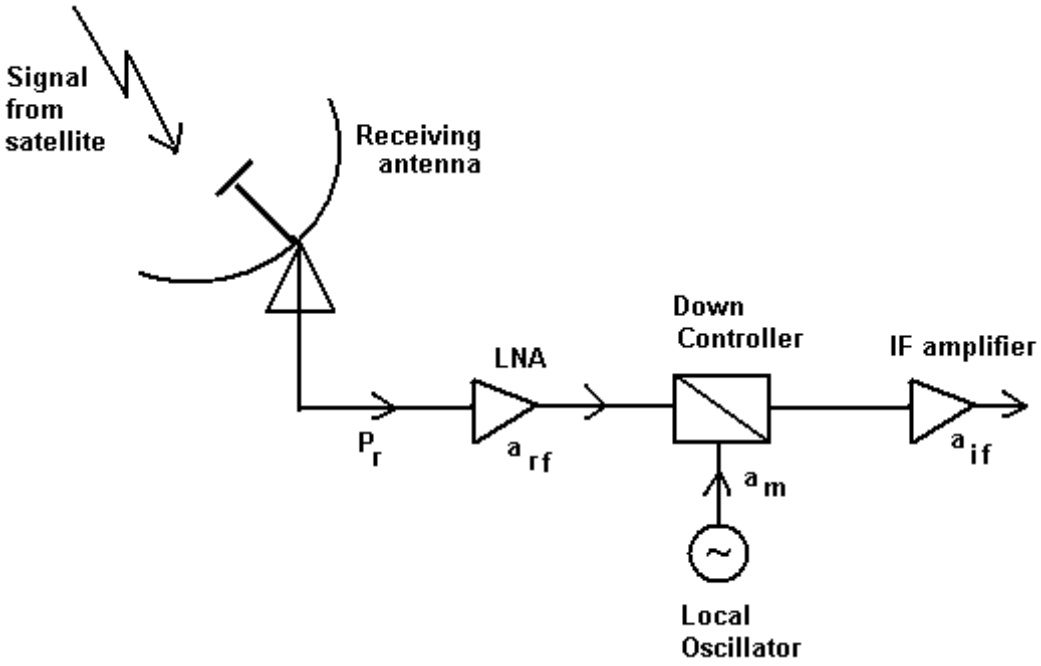


Figure 1:

(b) Explain in detail how geostationary satellites are tracked from the earth station? [6]

8. (a) What is a mobile earth station? Explain the applications of mobile earth stations? [8]

(b) Define and explain coordination are and coordination distance. [8]

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Code No: RR410406 **Set No. 2**

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1. Write a detailed summary about the satellite communication in the 21st century.

2. (a) Prove that the smallest value that the inclination angle can have is equal to the latitude of the launch site in the plane of the orbit. [8]
   (b) A satellite is in a circular equatorial orbit at an altitude of 10000 km from earth's surface. Determine the maximum eclipse time in a day during the full eclipse period. [8]

3. (a) What is telemetry? Explain in detail its requirement and analyse it. [8]
   (b) Explain the way by which various parameters in and around the satellite are measured using Telemetry. [8]

4. (a) Why uplink frequency is higher than downlink frequency. Explain "in detail". [6]
   (b) Explain various antennas structure employed for satellite communication.[10]

5. (a) Suppose we have a 4-GHZ receiver with the following gains and Noise temperatures. [8]
   $T_{in}$= 50k
   $T_{RF}$= 50k
   $T_m$= 500k
   $T_{IF}$= 1000k
   $G_{RF}$= 23dB
   $G_m$= 0dB
   $G_{IR}$= 30dB
   Calculate the system Noise temperature.
   (b) If in the above example a section of lossy wave guide is inserted between antenna and RF amplifier. Find the new system noise temperature. [4]
   (c) By what range the insertion of the lossy wave guide increases the over system noise temperature, measured at the CNA input. What will be the Carrier-to-Noise ratio. [4]

6. Explain the Frequency Division Multiple Access of Satellite System with one example. [16]

7. (a) What is an orthomode transducer? In which part of the satellite earth station it is required. Explain clearly. [8]

(b) In what way a satellite earth station is different from a microwave link? Explain clearly? [8]

8. (a) What is HPA? What are various types of HPAs? Compare these types. [8]

(b) Compare FDM and TDM systems in the earth station design. [8]

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1. Explain in detail the space and ground segments of a satellite communication network. [16]

2. Discuss in detail the orbital effects in satellite communication system performance. [16]

3. (a) What is spin stabilization? Why is it necessary? Explain various effects that is to be avoided and its remedial solution. [8]
   (b) What is station keeping? Explain various methods of station keeping. [8]

4. Why lens antennas are preferred for satellite communication, explain in detail. Explain the function of lens antenna. [16]

5. (a) Define Noise temperature. How it is used to calculate noise power and derive an equation for C/N ratio for the antenna delivering a power $P_r$ to the receiver with a IF gain of the receiver G(G is a ratio). [8]
   (b) Calculate the system noise temperature of the earth station receiver shown, assuming appropriate factors as shown in figure1 [8]

6. (a) Compare the performance of TDMA and FDMA. [6]
   (b) Describe the Multiple Access Information flow with suitable block diagram. [10]

7. (a) A 14/11 GHz antenna has a G/T ratio of 40.3dB at 11.2 GHz. The antenna gain is 64dB and the system noise temperature at 10 deg elevation angle in clear air conditions is 234k. The antenna aperture efficiency and noise temperature are detailed in the list below. During heavy rain, the slant path attenuation reaches 8dB for 0.01 percent of the year. Calculate G/T ratio for their fraction of the year and the corresponding reduction in C/N for the received signal. [10]
   Aperture efficiency: 71.3%
   Sky noise at 10deg elevation: 30k
   LNA noise temperature: 150k
   (b) Explain in detail how geostationary satellites are tracked from the earth station? [6]

8. (a) Draw and explain the block diagram of up link equipment for transmitting portion of FDM/FM/FDMA system. [8]

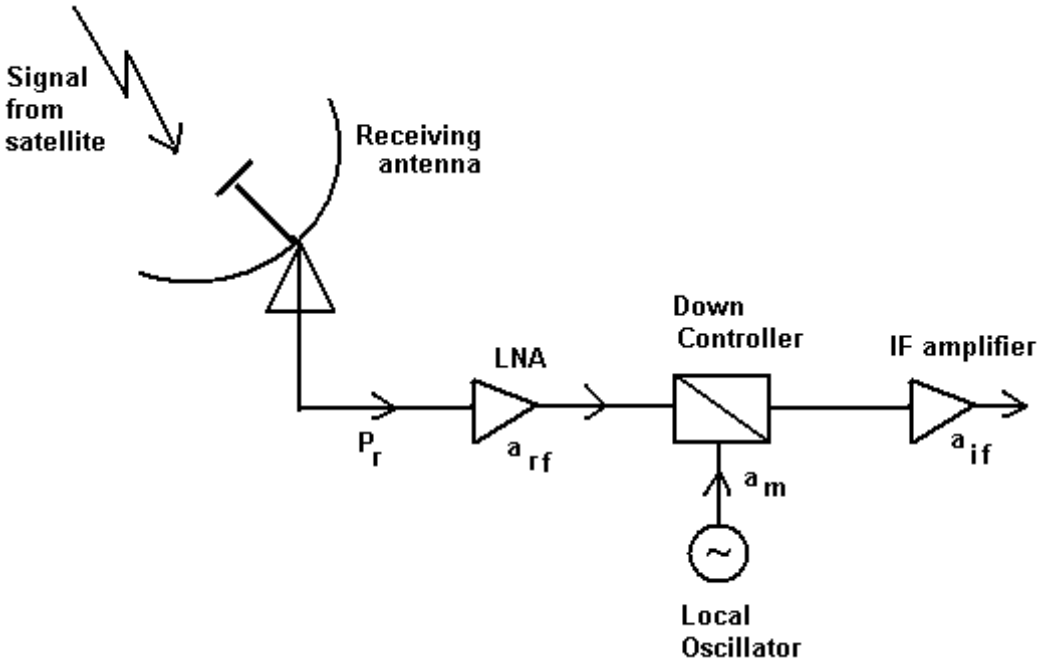


Figure 1:

(b) Draw the characteristics of FM threshold extension demodulator for TV receiver. [8]

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1. Explain in detail the space and ground segments of a satellite communication network. [16]

2. (a) Explain the method of determining the earth coverage and slant range for geostationary satellite. [8]
   (b) What is meant by station keeping of satellite? Explain its significance. [8]

3. (a) What is spin stabilization? Why is it necessary? Explain various effects that is to be avoided and its remedial solution. [8]
   (b) What is station keeping? Explain various methods of station keeping. [8]

4. What is faraday's rotation? How it affects the satellite communication? Explain how it is eliminated. [16]

5. (a) What are the various losses to be accounted into the Friis transmission equation for a practical Radio link for calculation of received power and give the altered equation suitably. [8]
   (b) A satellite as a distance of 36000km. from a point on the earths surface radiates a power of 2W from an antenna with a gain of 16dBW in the direction of the observer and operates at a frequency of 11GHZ. The receiving antenna has a gain of 523dB. Find the received power. Calculate the path loss also. [8]

6. (a) Compare the performance of TDMA and FDMA. [6]
   (b) Describe the Multiple Access Information flow with suitable block diagram. [10]

7. (a) A 14/11 GHz antenna has a G/T ratio of 40.3dB at 11.2 GHz. The antenna gain is 64dB and the system noise temperature at 10 deg elevation angle in clear air conditions is 234k. The antenna aperture efficiency and noise temperature are detailed in the list below. During heavy rain, the slant path attenuation reaches 8dB for 0.01 percent of the year. Calculate G/T ratio for their fraction of the year and the corresponding reduction in C/N for the received signal. [10]
   Aperture efficiency: 71.3%
   Sky noise at 10deg elevation: 30k
   LNA noise temperature: 150k

(b) Explain in detail how geostationary satellites are tracked from the earth station? [6]

8. (a) What is HPA? What are various types of HPAs? Compare these types. [8]

(b) Compare FDM and TDM systems in the earth station design. [8]

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