Code No: NR421902 **Set No.1**

IV B.Tech. II Semester Supplementary Examinations, July -2005
SATELLITE COMMUNICATIONS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain in detail about Indias participation in other International communications satellite systems.

2. (a) Draw and geometry of a geostationary link showing elevation, azimuth and range.
   (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.

3. What is attitude of satellite? Explain control mechanism employed for it.

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

5. (a) What is the necessity of keeping front end of the satellite receiver at the earth station in a helium-coolent: what is the range of temperature of the preamplifier.
   (b) A transponder using the global beam, a typical output back off level of 3dB with one access to that transponder so the radiated power from the transponder is 5dBW giving EIRP of 21dBW. at 40,000kM. The threshold of C/N is 11dB. Allowing a 7dB system margin. Calculate the diameter of the disk antenna assuming an antenna efficiency of 65% . Assume any data missing.

6. Explain the Time Division Multiple Access of Satellite System with one example,

7. Explain in detail about (14/12) GHz earth station function with neat block diagram

8. Analyse various noises disturbing the received signal from satellite at earth station.

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1. List the various advantages and disadvantages of satellite communication. Explain the various reason for preferring satellites than optical fibers which are providing very high bandwidth.

2. Describe the salient features of Direct Broadcast Satellite system with neat sketches

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

4. Explain in detail about (6/4)GHz communication subsystem.

5. (a) Suppose we have a 4-GHZ receiver with the following gains and Noise temperatures.
   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.
   (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.

6. (a) Consider an FDM-FM-FDMA carrier with the following parameters
   Channel bandwidth = 3100 Hz
   Multichannel peak factor = 10 dB
   Psophometric weighting factor = 2.5 dB
   Emphasis weighting factor = 4 dB
   Signal to Noise ratio = 51 dB
   Find the carrier bandwidth when the carrier to noise ratio is C/N = 15 dB and the number of channels per carrier is 192.
   (b) In FDM-FM-FDMA system, n = 24 channels, f_M = 108 kHz, S/N = 51 dB, and C/N = 12.5 dB. The combined Psophometric noise weighting factor and

preemphasis improvement factor is 6.5 dB. Find the rms frequency deviation of the test tone.

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.
   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?

8. Explain about various equipment used in earth station for its satisfactory operation .

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Code No: NR421902 **Set No.3**

IV B.Tech. II Semester Supplementary Examinations, July -2005
SATELLITE COMMUNICATIONS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. List the various advantages and disadvantages of satellite communication. Explain the various reason for preferring satellites than optical fibers which are providing very high bandwidth.

2. (a) Draw and geometry of a geostationary link showing elevation, azimuth and range.
   (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.

3. Explain the architectural design of spacecraft.

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

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).
   (b) Calculate the system noise temperature of the earth station receiver shown, assuming appropriate factors as shown in figure1

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

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.
   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?

8. (a) What is LNA? Why it is required at the front-end of the receiver? Explain.

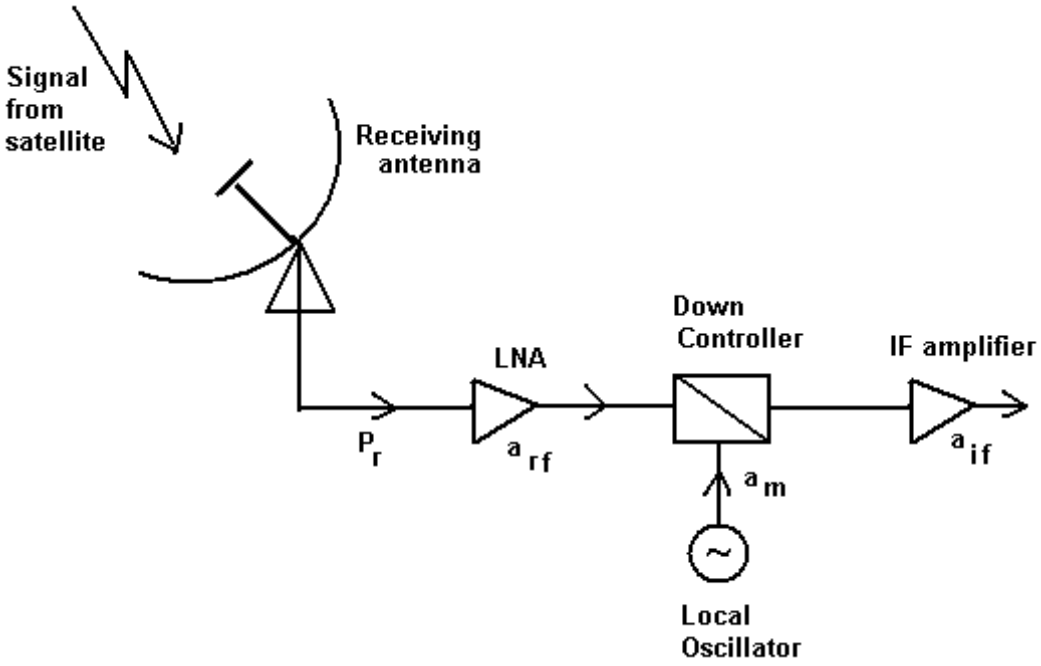

Figure 1:

(b) What is a TVRO? Explain various components of a TVRO system.

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Code No: NR421902 **Set No.4**

IV B.Tech. II Semester Supplementary Examinations, July -2005
SATELLITE COMMUNICATIONS
(Electronics & Computer Engineering)

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.

2. (a) A satellite is currently in its elliptical transfer orbit with apogee and perigee being at distances of 35786km and 300km respectively above the surface of earth. If the transfer orbit inclination to the equatorial plane is 0 degree, calculate the incremental velocity to be given to the satellite at the apogee point by the apogee kick motor to circularize the orbit.
   (b) Determine the maximum and minimum range in km from an earth station to geosynchronous satellite. To what round trip propagation times do these correspond?

3. (a) What are all effects on satellite by galactic sources? How do you avoid it?
   (b) Why is it necessary to go for three axes stabilization? Explain in detail.

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

5. (a) What is the necessity of keeping front end of the satellite receiver at the earth station in a helium-coolent: what is the range of temperature of the preamplifier.
   (b) A transponder using the global beam, a typical output back off level of 3dB with one access to that transponder so the radiated power from the transponder is 5dBW giving EIRP of 21dBW. at 40,000kM. The threshold of C/N is 11dB. Allowing a 7dB system margin. Calculate the diameter of the disk antenna assuming an antenna efficiency of 65% . Assume any data missing.

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

7. (a) What is an orthomode transducer? In which part of the satellite earth station it is required. Explain clearly.
   (b) In what way a satellite earth station is different from a microwave link? Explain clearly?

8. (a) Draw the block diagram of OUTDOOR unit for a DBS home receiver and explain the function of each block.
   (b) Explain how beam steering can achieved in parabolic reflector antenna.

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