Code No: RR421901 **Set No. 1**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
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. [16]

2. (a) What is meant by look angles? Explain them with reference to a geostationary satellite. [8]
   (b) Name the orbital aspects which are of importance in synchronous satellite communication. Explain these aspects. [8]

3. Explain about spacecraft subsystem in detail. [16]

4. Explain the operation of (14/12)GHz communication systems, with a neat block diagram. [16]

5. (a) What is the implication of G/T being negative. [3]
   (b) An earth station antenna has a diameter of 30m, has an overall efficiency of 68% and is used to receive a signal at 4150 MHZ. At this frequency the system Noise temperature is 79k when the antenna points at the satellite an elevation angle of 28^0 . What is the earth station G/T under these conditions? If heavy rain causes the sky temperature to increase so that the system noise temperature noise to 88k, what is the new G/T value? [8]
   (c) List the salient details of INTELSAT-IV down link specification. [5]

6. (a) What is meant by communication resource? What are the similarities and differences between the terms Multiplexing and Multiple Access ? [8]
   (b) A TDMA system operates at 100 Mbits/s with a 2 ms frame time. Assume that all slots are of equal length and that a guard time of 1μ s is required between slots. Compute the efficiency of the communications resource (CR) for the case of 1, 2, 5, 10 slots per frame. [8]

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. Analyse various noises disturbing the received signal from satellite at earth station. [16]

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Code No: RR421901 **Set No. 2**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
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. [16]

2. (a) What are the orbital parameters required to determine a satellite's orbit? Name and explain them. [10]
   (b) Explain as to how the location of a satellite in an orbit is carried out with respect to earth? [6]

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. Explain in detail about (6/4)GHz communication subsystem. [16]

5. (a) What are the different reasons for the difference in uplink and downlink frequencies. [8]
   (b) A satellite down link at 12GHZ operates with a transmit power of 6W and an antenna gain of 48.2dBW. Calculate EIRP in dBW. [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
   (b) Explain in detail how geostationary satellites are tracked from the earth station? [6]

8. Analyse various noises disturbing the received signal from satellite at earth station. [16]

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Code No: RR421901 **Set No. 3**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
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. Write a detailed summary about the satellite communication towards year 2000 and 21st century. [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. Explain in detail about (6/4)GHz communication subsystem. [16]
5. (a) Derive the general link design equation for a satellite and prove that a large G/T ratio provides better C/N ratio. [10]
   (b) A satellite at a distance of 36,000 km from earth radiates a power of 5W from an antenna with a gain of 16dB. Find the power received by an earth station antenna with a gain of 45dB. Operating frequency is 11GHZ. [6]
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
   (b) Explain in detail how geostationary satellites are tracked from the earth station? [6]
8. (a) Draw the simplified diagram of large Earth station equipment using FDM/FM/FDMA technology and explain each block in detail. [10]
   (b) Explain the functions of major RF components used in the above Earth station design. [6]

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Code No: RR421901 **Set No. 4**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
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 frequency bands being used in satellite communication. Compare the advantages and disadvantages of different bands considering the effects of propagation media. [16]

2. Compare the propagation effects in the maritime, aeronautical and land mobile satellite channels. [16]

3. What is attitude of satellite? Explain control mechanism employed for it. [16]

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

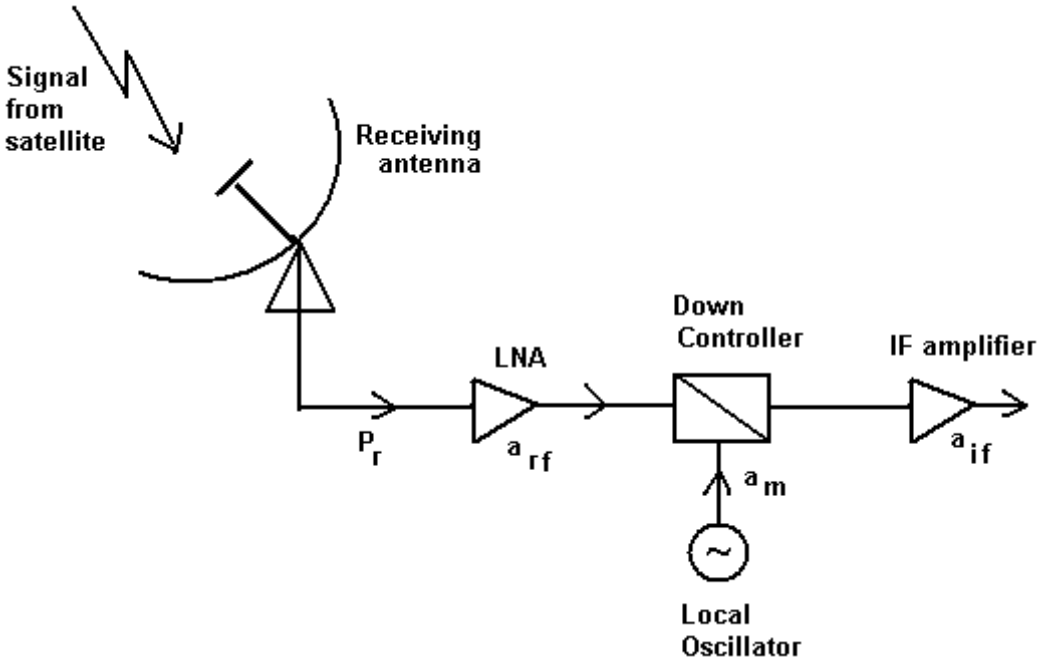

Figure 1:

6. FDMA is used for uplink access in a satellite digital network, with each earth station transmitting at the T1 bit rate of 1.544 Mb/s. Calculate
   (a) the uplink C/N ratio required to provide a E/N = 14 dB ratio at the satellite and [10]
   (b) the earth station EIRP needed to realize the C/N value. The satellite G/T value is 8 dB/K, and total uplink losses amount to 210 dB. [6]
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. Explain the operation of Digital Earth station with neat block diagram. [16]

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