**Satellite Communications**

**Assignment-I**

1. a) What are the Kepler’s laws and describe the orbit of a satellite using these laws.

b) What is the difference between geostationary orbit and geosynchronous orbit and mention the advantages of geostationary Satellites?

1. a) What are the methods used to place a satellite in to a geostationary orbit? Describe them.
2. What are the various applications of satellite communication systems?
3. a) What are the orbital effects in communication system performance and describe them in detail.
4. a) Describe orbital perturbations in detail.

b) How do you calculate Look angles of a geostationary satellite?

1. a) What is the significance of bathtub curve? Describe various redundancy connections used in a satellite.

b) Draw the block diagram of TTC&M and describe in detail.

1. a) Draw the block diagram of simplified satellite earth station receiver and derive an equation for its system noise temperature.

b) Derive the satellite link equation.

1. a) What do you mean by space qualification and derive an equation for reliability of a device.

( b) Describe satellite orbital control system.

1. What is inter-modulation? Derive an equation for the power of inter-modulation products at the output of a High Power Amplifier (HPA) in the FDMA System.
2. What is the importance of back-off loss in satellite communications? Write an equation for calculation of C/N with inter-modulation and explain its significance.
3. What is the importance of back-off loss in FDMA system and give an equation for overall C/N ratio in an earth station receiver in terms of (C/N)IM,(C/N)DN, and (C/N)UP & explain its significance.
4. Write short notes on the following:
5. Advantages of C-band over ka and ku bands
6. Differentiate single conversion and double conversion transponders
7. Compare TDMA, FDMA and CDMA
8. Satellite visibility test, give the equation for maximum angular separation between earth station and sub satellite point.
9. What is the importance of G/T ratio?
10. Reliability of a Satellite sub systems.
11. Performance of TWT Amplifiers in FDMA Transponder.

**Problems**

1. An Earth Station situated in the Docklands of London, England, needs to calculate the look angle to a geostationary satellite in the Indian Ocean operated by INTELSAT. The details of the earth station site and the satellite are as follows:

Earth station latitude and longitude are 52.00 N and 00

Satellite longitude (Sub Satellite Point) is 66. 00 E.

1. A 4GHz satellite receiver has: Tin = 25 k, TRF = 50 k, TIF = 1000 k, Tm = 500 k, GRF = 23 dB, GIF = 30 dB. Calculate the system Noise Temperature, assuming the mixer has a gain of GM = 0 dB. Recalculate the system Noise temperature when the mixer has a loss of 10 dB.
2. A Satellite at a distance of 40,000 km from a point on the earth surface radiates a power of 10 W from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density & power received by an antenna at this point with an effective area of 10 m2.
3. If the altitude of Satellite is 35,768.03 km, then find its velocity (km/s) and orbital period ( H M S)
4. If the noise figure of a receiver is 0.56 dB then find out its noise temperature (k)?
5. If the altitude of Satellite is 10,255 km, then find its velocity (km/s) and orbital period ( H M S)
6. The gain of receiver is 60.6 dB and its system noise temperature is 19 dBk, then find out its G/T ratio?