Digital Assignment-1

Satellite communications- Dr. Niraj Kumar

Total: 40 Marks, weightage: 10 Marks

1. A satellite in an elliptical orbit around the earth has an apogee of 1ABCD km and a perigee of ABCD km (Where, ABCD is your last four digit of reg.no e.g 21BEC1898 represents apogee of 11898 Km and perigee of 1898 Km.
   (a) What is the orbital period of this satellite? Give your answer in hours. Note: assume the average radius of the earth is 6,378.137 km and Kepler's constant has the value $3.986004418 \times 105\ km^3/s^2$.
   (b) What is eccentricity of the orbit?
   (c) If this orbits to be converted into circular orbit without changing the time period, what would be the radius of the circular orbit? **[10 Marks]**
2. A geostationary satellite provides service to a region which can be covered by the beam of an antenna on the satellite with a beamwidth of A.B° (A and B has the same meaning as Q.1). The satellite carries transponders for Ku band and Ka band, with separate antennas for transmit and receive. For centre frequencies of 14.0/11.5 GHz and 30.0/20.0 GHz, determine the diameters of the four antennas on the satellite.
   (a) Find the diameters of the two transmitting antennas. Specify the diameter and calculate the gain at each frequency.
   (b) Find the diameters of the two receiving antennas. Specify the diameter and calculate the gain at each frequency. **[10 Marks]**
3. Take any GEO satellite of ISRO and earth station in any Indian city with its latitude and longitude and calculate the look angle. Data taken should be valid for Indian continent and mention the city with its geolocation. **[10 Marks]**
4. Explain the complete process of CHANDRAYAAN-3 launch to soft landing at moon. (You may type or write as per your choice but avoid plagiarism). **[10 Marks]**