53 (EC 814) STCM

2014

SATELLITE COMMUNICATION

Paper : EC 814

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* State Kepler's laws of planetary motion and describe the orbit of a satellite. 10

(b) A satellite is in an elliptical orbit with a perigee of 600*km* and an apogee of 2000*km*. Using a mean earth radius of 6378·14*km* find the period of the orbit and the eccentricity of the orbit. 5

(c) If an earth station with latitude and longitude of 52·0°*N* and 0° has to communicate with a geostationary satellite with a sub-satellite point with longitude 66°*E*, then find the elevation angle. 5

2. *(a)* Explain the attitude and orbit control system of a satellite communication system. 10

(b) What are the different types of antennas used on satellites ? Explain each. 10

3. *(a)* Explain the basic transmission theory of a satellite communication system. 10

(b) How the system noise temperature of a receiver can be calculated in satellite communication system ? 5

(c) An earth station antenna has a diameter of $30m$ has an overall efficiency of 68% and is used to receive a signal at $4150MHz$. At this frequency the system noise is $80K$. When the antenna points at the satellite at an elevation angle of 28° what is the earth station G/T ratio under these conditions ? If heavy rain causes the sky temperature to increase so that the system noise temperature rises to $90K$, what is the new G/T value ? 5

4. *(a)* Explain the spread spectrum transmission and reception technique using an example. 10

(b) How the third order intermodulation products are generated in an FDMA system ? 10

5. *(a)* Explain the block diagram of the tracking system of an earth station. 10

(b) Explain the configuration of an earth station receiver. 10

6. *(a)* Explain the *four* important factors that influence the design of any satellite communication system. 10

(b) How the position of an object on earth can be determined using GPS ? 10

7. Write short notes on : 10×2=20

(a) Satellite signal acquisition

(b) Different types of orbits of satellite.