(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2894 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VIII) EVEN THEORY EXAMINATION 2012-13

SATELLITE COMMUNICATION

Time : 3 Hours *Total Marks : 100*

Note :– (1) Attempt **all** questions.

(2) All questions carry equal marks.

(Assume earth's radius = 6360 km, Kepler's constant = 3.986×10^5 km^3/s^2 and Boltzmann's constant, k = 1.38×10^{-23} J/K)

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) Name and explain various orbital parameters to determine a satellite's orbit. How the location of satellite in an orbit is carried out with respect to earth ?

(b) A satellite moving in a highly eccentric Molniya orbit having the farthest and the closest points as 35000 km and 500 km respectively from the surface of the earth. Determine the orbital time period and the velocity at the apogee and perigee points. (Assume earth's radius equals to 6360 km and Kepler's constant = 3.986×10^5 km^3/s^2)

(c) What are the types of satellite launcher ? Briefly describe the satellite launch sequence.

(d) Explain what is meant by the geostationary orbit. How do the geostationary orbit and a geosynchronous orbit differ ?

(e) Explain as to how does the solar eclipse affect the working of a communication satellite ? Mention the duration and month when the eclipse effects are maximum.

(f) An earth station is located at 30° W longitude and 60° N latitude. Determine the earth station azimuth and elevation angles with respect to geostationary satellite located at 50° W longitudes. (Assume orbital radius = 42164 km and earth's radius 6360 km)

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Discuss about various satellite subsystems highlighting their important functions and characteristics.

(b) The following parameters apply to a satellite downlink : saturation [EIRP] 22.5 dBW, free-space loss 195 dB, other losses are 1.5 dB, earth station G/T is 37.5 dB/K. Calculate the carrier-to-noise density (C/N_o) at the earth station. Assuming an output back-off of 6 dB is applied, what is the new value of (C/N_o) ?

(c) Derive the expression for overall satellite link design. How a complete satellite link becomes down link limited ? How the overall satellite link design is affected by intermodulation noise ?

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) (i) What do you mean by 'threshold' in FM detector ? Explain FM improvement and derive the S/N ratio for SCPC signals.

(ii) A 1 KHz test tone is used to produce a peak deviation of 5 KHz in an FM system. Calculate the FM improvement and Post-detector S/N ratio, if the received C/N ratio is 30 dB.

(b) What is meant by TDMA frame acquisition and frame synchronization ? What is frame delay ? How does it help in carrying out TDMA frame acquisition techniques ?

(c) Explain the working of a basic CDMA system. How does it employ spread-spectrurm technique during the multiple accesses of the signals ? Also determine the throughput efficiency for this system.

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) What are the propagation impairments that affect the design of the satellite communication systems ? Why C-band satellite transmission is most suitable ?

(b) The generator polynomial of a (7, 4) cyclic code is $G(a) = x^3 + x^2 + x + 1$, obtain all the code vectors for the code in non-systematic form.

(c) Write short notes on :

(i) Depolarization effects on satellite link

(ii) Automatic repeat request technique.

5. Attempt any **two** parts of the following : **(10×2=20)**

(a) Describe the operation of a typical VSAT system. State briefly where VSAT systems find widest application.

(b) Explain the basic principle of a GPS system. Explain why a minimum of four satellites must be visible at an earth location utilizing the GPS system for position determination.

(c) Briefly describe the overall working of Direct Broadcast Satellite (DBS) television network. Explain the working of DBS-TV receiver with the help of a neat block diagram.