Printed Pages : 4 TEC24

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

PAPER ID : 0313 Roll No.

B.Tech

(SEM VII) ODD SEMESTER THEORY EXAMINATION 2009-10

SATELLITE COMMUNICATION

Time : 3 Hours] *[Total Marks : 100*

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

*(2) **All** questions carry **equal** marks.*

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

(a) What are the orbital parameters required to determine a satellite's orbit? Name and explain them.

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

(c) What is meant by look angles? Explain them with reference to a geostationary satellite and the earth station.

(d) Explain the different steps involved in launching a geo-stationary satellite.

(e) Explain what is meant by the earth eclipse of an earth-orbiting satellite. Why they occur near the equinoxes ?

(f) What do you mean by station keeping of satellite? Explain its significance and also the methods to achieve it.

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

(a) Draw the block diagram of a satellite communication subsystem and explain the function of each block. Also explain why operation near the saturation point of TWTA is to be avoided when multiple carriers are being amplified simultaneously.

(b) A satellite TV signal occupies the full 36 MHz transponder bandwidth and is desired to provide a (C/N) ratio of 22 dB at the earth station. If a downlink frequency of 4GHz is employed and other losses amount to 3.4 dB, what must be the G/T of the earth station if EIRP is 37 dBW? The path length may be assumed to be 40000 km. (Batzmann's constant, $k = 1.38 \times 10^{-23}$ J/K)

(c) What are the factors that affect the uplink design and the downlink design in geostationary satellite communication ? Derive the expression for (C/N) of uplink, downlink and overall satellite link and demonstrate that downlink design is more critical.

3 Attempt any **four** parts of the following : **5×4=20**

(a) A 1-kHz test tone is used to produce a peak deviation of 5 kHz in an FM system. Given that the received (C/N) is 30 dB, calculate the receiver FM improvement and the (S/N) at the output of the demodulator.

(b) What are the various methods of digital modulation techniques and which one is mostly used in digital satellite communications ? Explain with reasons.

(c) What is time division multiplexing? How does it differ from frequency division multiplexing? Explain its merits.

(d) What is SPADE system? Briefly describe its operation.

(e) Why network synchronization in TDMA is very important? Explain satellite loop-back synchronization and cooperative synchronization.

(f) Write down the basic properties of pseudo-random binary sequence used in CDMA.

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

(a) A received codeword is 1011000. Determine using the given parity check matrix (H), if this is a valid codeword, and if not, write out the error vector on the assumption that only one error is present.

(b) Describe how convolution coding is achieved. State some of the main advantages and disadvantages of this type of code compared with block codes.

(c) How atmospheric absorption and depolarization affect the propagation on satellite-earth path? Explain in detail.

5 Write short notes on any **four** : **5×4=20**

(a) LEO satellites

(b) Direct broadcast satellites

(c) Satellite navigation

(d) Unique word in TDMA

(e) Regenerative transponders

(f) SDMA
