Printed Pages – 8

328714 (28)

BE (7th Semester)

Examination, Nov.-Dec., 2021

Branch : Et & T

SATELLITE COMMUNICATION

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c) & (d).

Q. 1. (a) What is the basic difference between active and passive satellite systems ? 2

(b) Explain as to how the location of satellite in an orbit is carried out with respect to earth ? What are direct and retrograde orbits ? Also explain the ascending, descending node, right ascension and nodal regression. 7

(c) Explain as to how does the solar eclipse affect the working of a communication satellite ? Mention the duration and the month when the eclipse effects are maximum. 7

(d) Consider two earth stations A and B with longitudes at 60°W and 90°W respectively and latitudes at 30°N and 45°N respectively. They are communicating with each other via a geostationary satellite located at 105°W. Find the total delay in sending 500 kilo bits of information from one station to the other if the transmission speed is 10 Mbps. 7

(Assume satellite orbital radius = 42164 km and earth's radius = 6378 km)

Q. 2. (a) What is baseband analog signal and its frequency spectrum ? 2

(b) What is the system noise temperature ? How does it affect the C/N and G/T ratios ? 7

(c) How does the non-linear behaviour of a TWTA affect the operational characteristics (C/N) of a satellite link ? What are the intermodulation products and how are these generated with TWTAs ? 7

(d) For a 60 channel FDM system with a maximum baseband frequency of f_m = 252 kHz and a specified top-channel signal-to-noise ratio S/N = 52 dB. Find out the bandwidth. The FDM multi-channel rms frequency deviation is 546 kHz. Also,

find out the FDM multichannel loading factor, test tone rms frequency deviation and C/N ratio. The improvement in emphasis and psophometric weighting is around 6.5 dB. 7

Q. 3. (a) What are the overheads in TDMA frame ? 2

(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 and frame synchronization techniques ? 7

(c) What is satellite switching ? Discuss the operation of a typical SS-TDMA system.

How is SS-TDMA different from a beam hopping TDMA ? 7

(d) Calculate the voice channel capacity for INTESAT system frame in which : 7

Total frame length = 120,832 symbols

Frame period = 2 ms

No. of traffic burst / frame = 14

No. of reference burst / frame = 2

Guard interval = 103 symbols.

Preamble for reference burst = 288 symbols

Preamble for traffic burst = 280 symbols.

Voice channel bit rate = 64 kbps

and QPSK modulation is used.

Q. 4. (a) What is the telemetry, tracking and command subsystem ? 2

(b) What is the propulsion sub-system ? Explain its constituent and their function. Which is the most popular propellent being used ? 7

(c) What is the communication subsystem ? Explain the construction of a repeater telling the difference between a simple repeater and a regenerative repeater. 7

(d) What do you mean by the reliability, mean time before failure, effective failure rate as applied to satellite subsystem and components ? Explain the 'bath tub' curve. 7

Q. 5. (a) What is a TVRO system ? 2

(b) What are the equipments that an earth station requires ? Explain their design requirements. 7

(c) Explain with suitable diagram the working of various antenna subsystems to be used in earth stations. Give antenna requirements for large and small earth stations. 7

(d) What is meant by tracking and pointing ? Explain its significance and the technique as to how these are achieved ? 7