G 6153

M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Communication Systems

CO 1653 – SATELLITE COMMUNICATION

(Regulation 2005)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define mean anomaly.

2. Write the expression of semi major axis of satellite orbit.

3. What is despun antenna? Why is it required?

4. Write the factors considered for earth station site selection.

5. What is figure of merit? Write its significance.

6. Define EIRP.

7. What is the role UW in TDMA frame?

8. Define process gain in spread spectrum access.

9. Write the difference between CATV and DTH.

10. Write the application of GPS.

PART B — (5 × 16 = 80 marks)

11. (a) State Kepler's three laws of planetary motion. Illustrate in each case their relevance to artificial satellite orbiting the earth.

Or

(b) (i) Explain the configuration of satellite launch vehicles and describe how the location for satellite launch are selected? (12)

(ii) Compare the features of different types of satellite launch vehicles. (4)

12. (a) (i) Describe the tracking, telemetry and command facilities of a satellite communication system. (8)

(ii) Explain what is meant by satellite attitude and briefly describe two forms of attitude control. (8)

Or

(b) (i) Explain about thermal control in detail. Why is it necessary in satellite? (8)

(ii) Describe briefly how beam shaping of satellite antenna radiation pattern may be achieved. (8)

13. (a) (i) For an uplink the required [C/N] ratio is 20 dB. The operating frequency is 30 GHz and the bandwidth is 72 MHz. The satellite [G/T] is 14.5 dBk^{-1}. Assuming operation with 11 dB input back off, calculate saturation flux density if [RFL] = 1 dB. Also calculate the earth station [EIRP] required. (8)

(ii) Obtain the expression for system noise temperature. (8)

Or

(b) (i) Obtain the expression for overall carrier to noise ratio of a satellite communication system. (8)

(ii) A duplex satellite link between earth station A and B has the following outages. (8)

Uplink of A   : 0.05%

Downlink of B   : 0.06%

Uplink of B   : 0.08%

Downlink of A   : 0.04%

Find the outage.

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14. (a) (i) Find the miss detection and false detection probabilities for a unique word with a length of N = 24 bits. The channel bit error rate is 10^{-4} and the detection threshold is 5. (8)

(ii) Consider a TDMA frame with following parameters TDMA frame length : 2 ms, TDMA burst bit rate = 120 Mbps 32 traffic burst and 2 reference bursts. (8)

CCR sequence	:	352 bits
UW sequence	:	48 bits
Order wire channel	:	64 bits
Management channel	:	256 bits
Transit timing channel	:	320 bits
Service channel	:	320 bits
Guard time bits	:	48 bits

(1) Find frame efficiency.

(2) Assume bit rate of voice : 32 kbps, bit rate of data : 9.6 kbps, and two third of the capacity is for voice. Find the number of voice channels and data channels.

Or

(b) (i) Compare CDMA and FDMA. (8)

(ii) Consider a 60 channel FDM–FM–FDMA system with base band expanding from 12 to 252 kHz and a specified noise per channel of 10,000 pWp. Assume a 200 kHz rms test tone frequency deviation and a 5.5 dB weighting improvement

(1) Find the carrier to noise density ratio

(2) Find the FDM–FM–FDMA bandwidth

(3) Find the carrier to noise ratio. (8)

15. (a) Write short notes on :

(i) Mobile satellite service (8)

(ii) Global positioning system. (8)

Or

(b) Write short notes on :

(i) VSAT (8)

(ii) RADARSAT. (8)