25-4. Which system has the best projected BER?

a. 8-QAM, C/N = 15 dB, $B = 2f_N$, f_b = 60 Mbps

b. QPSK, C/N = 16 dB, $B = f_N$, f_b = 40 Mbps

a. B = 20 MHz, E_b/N_o = 19.24 dB

b. F_N = 20 MHz, E_b/N_o = 13 dB

8-QAM, Pe between 10^{-4} and 10^{-5}

QPSK, Pe better than 10^{-5}

25-8. Determine the minimum C/N ratio required to achieve a $P(e)$ of 10^{-5} for an 8-PSK receiver with a bandwidth equal to f_N.

18.5 dB

25-12. For an earth station receiver with an equivalent input temperature of 200°K, a noise bandwidth of 20 MHz, a receive antenna gain of 50 dB, and a carrier frequency of 12 GHz, determine the following: G/T_e, N_o, and N.

G/T_e = -27 dB

N_o = -205.6 dBW

N = -132.6 dBW

25-16. A satellite system operates at 14 GHz uplink and 11 GHz downlink and has a projected $P(e)$ of one bit error in every I million bits transmitted. The modulation scheme is 8-PSK, and the system will carry 90 Mbps. The equivalent noise temperature of the receiver is 350°K, and the receiver noise bandwidth is equal to the minimum Nyquist frequency. Determine the following parameter-, minimum theoretical C/N ratio, minimum theoretical E_b/N_O ratio, noise density, total receiver input noise, minimum receive carrier power, and the minimum energy per bit at the receiver input

B = 30 MHz, C/N = 20 dB

E_b/N_o = 15.23 dB, N_o = -173.2 dBm

N = -98.4 dBm, C_{min} = -78.4 dBm

E_b = -157.9 dBJ

25-20. Determine the total noise power for a receiver with an input bandwidth of 40 MHz and an equivalent noise temperature of 800°K.

123.5 dBW

25-24. Determine the carrier-to-noise density ratio for a receiver with a -80-dBW carrier input power, equivalent noise temperature of 240°K, and a bandwidth of 10 Mhz.

124.8 dB

25-28. Complete the following link budget:

Uplink parameters

I . Earth station output power at saturation, 12 kW
2. Earth station back-off loss, 4 dB
3. Earth station branching and feeder losses, 2 dB
4. Earth station antenna gain for a 10-m parabolic dish at 14 GHz
5. Free-space path loss for 14 GHz
6. Additional uplink losses due to Earth's atmosphere, I dB
7. Satellite transponder G/T_e - 3 dBk

8. Transmission bit rate, 80 Mbps
9. Modulation scheme, 4-PSK

Downlink parameters

1. Satellite transmitter output power at saturation, 5 W
2. Satellite station transmit antenna gain for a 0.5-m parabolic dish at 12 GHz
3. Satellite modulation back-off loss, I dB
4. Free-space path loss for 12 GHz
5. Additional downlink losses due to Earth's atmosphere, 1 dB
6. Earth station receive antenna gain for a 10-m parabolic dish at 12 GHz
7. Earth station equivalent noise temperature, 300°K
8. Transmission bit rate, 80 Mbps
9. Modulation scheme, 4-PSK

UP-Link

EIRP = 97.3 dBW
C’ = -110.1 dBW
C/No = 115.5 dB
E_b/N_o = 36.5 dB
For a minimum bandwidth system
C/N = 29 dB

Down-Link

EIRP = 36 dBW
C’ = -170 dBW
C/No = 92.8 dB
E_b/N_o = 13.78 dB
For a minimum bandwidth system
C/N = 16.77 dB