1  Noiseless Channel

A noiseless 4-kHz channel is sampled every 1 msec. What is the maximum data rate?

2  Noisy Channel

If a binary signal is sent over a 3kHz channel whose signal-to-noise ratio is 20 dB, what is the maximum achievable data rate?

3  Campus Cabling

Suggest a cabling (copper, fiber) for the below campus. Try to minimize fiber cabling. All end user machines are PCs. The servers are all in Building 2 at floor 1. Each building has 3 floors. Each building’s base layout is 20m x 40m.

4  Framing

The following character encoding is used in a data link protocol: A 01000111, B 11100011, FLAG 01111110, ESC 11100000. Show the bit sequence transmitted (in binary) for the four character frame: A B ESC FLAG using a) flag bytes with byte stuffing and b) starting and ending flag bytes with bit stuffing.

5  CRC

A bit stream 1001101 is transmitted using the standard CRC method. The generator polynomial is $x^3+1$. Show the actual bit string transmitted. Suppose the third bit from left is inverted during transmission. Show that this error is detected at the receiver’s end.