4.2 QUIZ QUESTION 1 (1 point possible)

Suppose the response of a communication channel to the training sequence can be given as

$$y(n) = 6 + 22u(n - 1500) - 22u(n - 2000).$$

If we received an output sample with value of 15, what would be our estimate of the corresponding input bit?

Please select the correct answer.

- (•) 1
- ( ) 0 ✔

EXPLANATION

The minimum value of the response to the training sequence is 6, and the maximum was 28. We can decide whether the input bit was 0 or 1 by comparing to a threshold of (6+28)/2 = 17.

Since the output has value 15, which is less than 17, we decode to a bit 0.

Hide Answer *You have used 0 of 1 submissions*

4.2 QUIZ QUESTION 2 (1 point possible)

Suppose that a discrete time LTI channel has a given step response:

$$s(n) = 0.9(1 - 0.8^{n+1})u(n)$$

Assume that we transmit, as a training sequence, a pulse with unit height and width W samples. Assume that the pulse starts at sample index 0. What is the minimum value of W so that the channel response at the sample index W is larger than 0.8?

Please key in the numerical value of your answer in the box provided below.

9.31885

9.31885

Help

Answer: 9.424

EXPLANATION

A pulse of width W samples that starts at time 0, ends at time W-1. For the response of the channel, at the end of the pulse, to be greater than 0.8, we must have

$$s(W) = 0.9(1 - 0.8^{W-1+1}) > 0.8$$

Manipulating this inequality, we obtain

$$\begin{aligned} 0.9(1 - 0.8^{W}) &> 0.8 \\ 0.8^{W+1} &< 1 - \frac{0.8}{0.9} \\ W &> \frac{\ln 0.1111}{\ln 0.8} \approx 9.847 \end{aligned}$$

Thus, the minimum pulse length in samples should be 10.

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