Communication Exercises

The **due date** for this homework is **Tue 16 Apr 2013 12:59 AM EDT -0400**.

Question 1

Secret Communications

A system for hiding AM transmissions has the transmitter randomly switching between two carrier frequencies f_1 and f_2. "Random switching" means that one carrier frequency is used for some period of time, then switches to the other for a while, back to the first, etc. The receiver knows the carrier frequencies but *not* when the frequency switches occur. Consequently, the receiver must be designed to receive transmissions regardless of which carrier frequency is used. Assume the message has a baseband bandwidth of W. The channel attenuates the transmitted signal (attenuation constant α) and adds white noise of spectral height $\frac{N_0}{2}$.

How frequency separation between the two carrier frequencies must be employed?

Type an expression for the separation $|f_2 - f_1|$ in terms of f_1 (typed as `f1`), f_2 (typed as `f2`), α (typed as `a`), N_0 (typed as `N0`) and W (typed as `W`).

Preview   Help

Question 2

What receiver should be designed?

- ○ Receiver tuned to f_1 in cascade with a receiver tuned to f_2.

- ○ The receiver has to know the frequency switching pattern.

- ○ Receiver tuned to $f_1 + f_2$.

- ○ Receiver tuned to f_1 in parallel with a receiver tuned to f_2, with the two outputs added together.
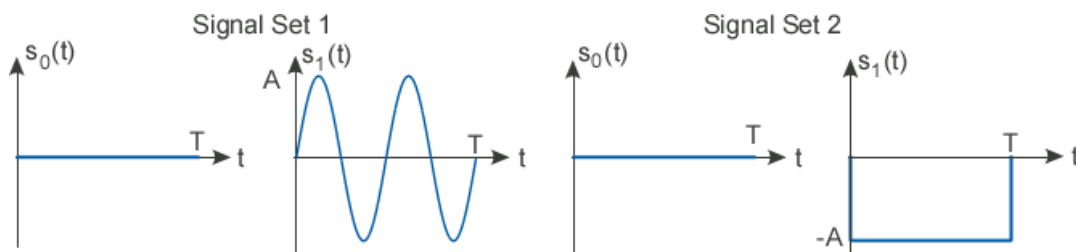
Question 3

What is the signal-to-noise ratio for the demodulated signal?

Enter an expression for the signal-to-noise ratio in terms of f_1 (typed as `f1`), f_2 (typed as `f2`), α (typed as `a`), the transmitter's amplitude A (typed as `A`), N_0 (typed as `N0`) and W (typed as `W`). Type the message signal's power $\mathrm{power}[m]$ as `Pm`.

Preview   Help

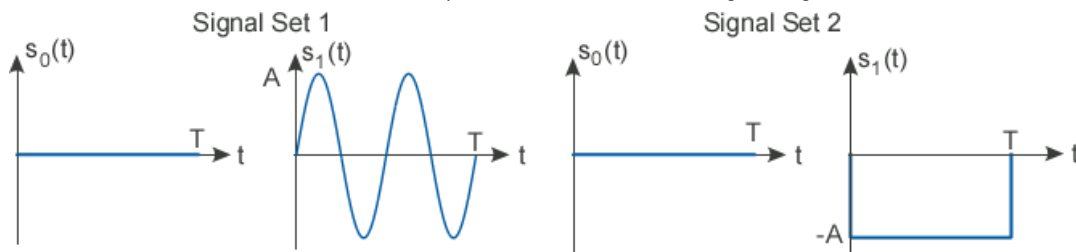# Question 4

Which signal set will yield the smallest probability of error? Or will they yield the same performance?

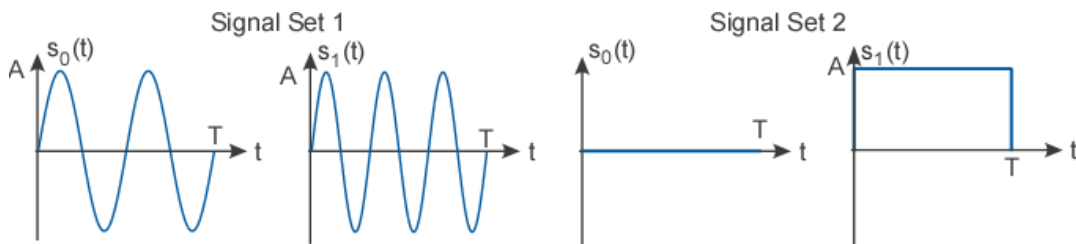○ Signal set 1

○ Signal set 2

○ They yield the same performance.

Question 5

Which signal set that the smallest bandwidth? Or are they the same?

- ○ Signal set 1

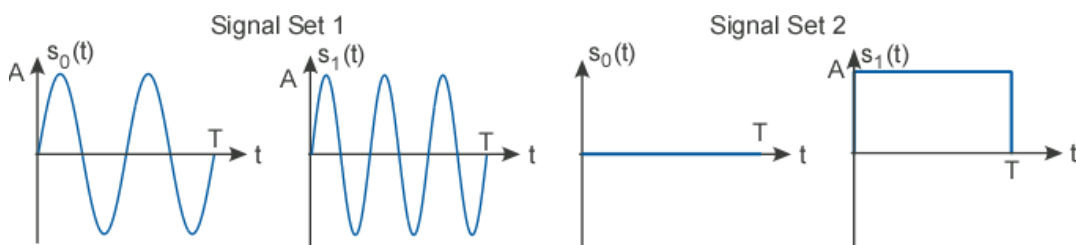- ○ Signal set 2

- ○ They have the same bandwidth.

Question 6

Which signal set will yield the smallest probability of error? Or will they yield the same performance?

- ○ Signal set 2

- ○ Signal set 1

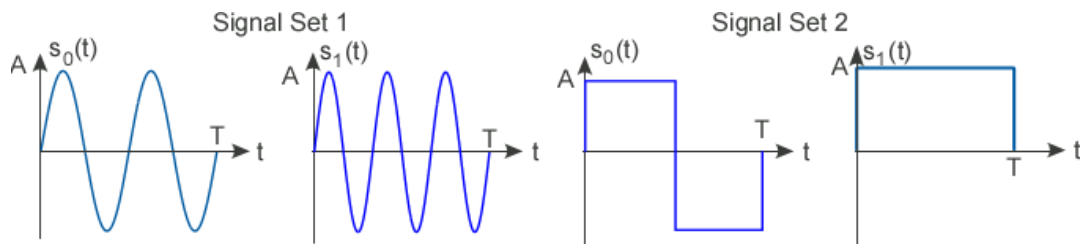- ○ They yield the same performance.

Question 7

Which signal set that the smallest bandwidth? Or are they the same?

- ○ Signal set 1

○ Signal set 2

○ They have the same bandwidth.

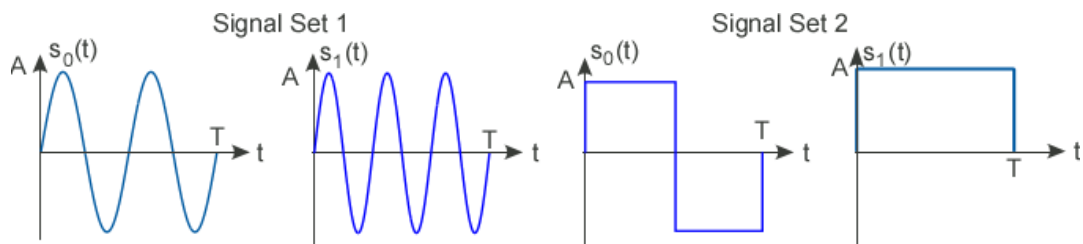# Question 8

Which signal set will yield the smallest probability of error? Or will they yield the same performance?

○ They yield the same performance.

○ Signal set 1

○ Signal set 2

Question 9

Which signal set that the smallest bandwidth? Or are they the same?

○ Signal set 1

○ Signal set 2

○ They have the same bandwidth.

☐   In accordance with the Honor Code, I certify that my answers here are my own
work.

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