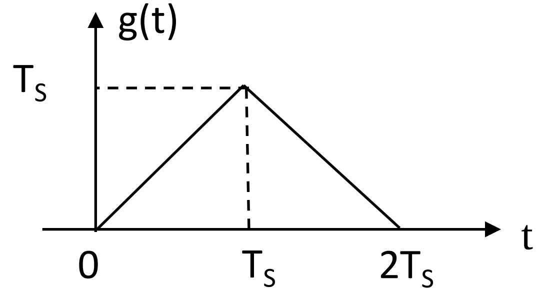
Let's the following $g(t)=h(t)*h_c(t)*h_r(t)$ be the impulse response of the whole transmission channel:



(T_s = symbol period)

QUESTION 1

The transmission channel:

Click on the bullet corresponding to the good answer

A Respect the Nyquist criterion

B Can respect the Nyquist criterion

C Cannot respect the Nyquist criterion

D Not enough elements to answer the question

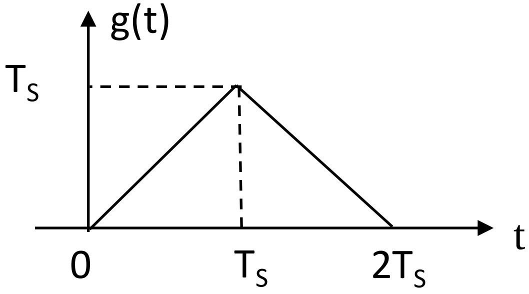
BAD ANSWER

Click here to CHANGE YOUR ANSWER

GOOD ANSWER

Click here for the FOLLOWING QUESTION

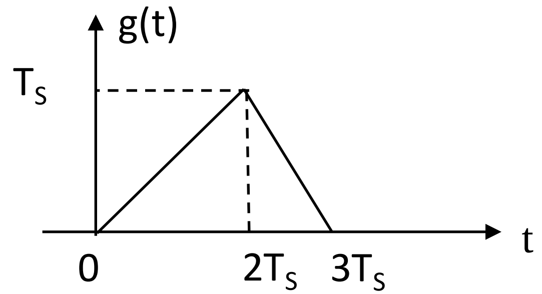
The Nyquist criterion can be respected IF we sample in the reveiver at time instants t_0+mT_s with $t_0=T_s$
Then we obtain:



$$\begin{cases} g(t_0) \neq 0 \\ g(t_0 + pT_s) = 0 \ for \ p \in Z^* \end{cases}$$

Time domain expression for the Nyquist criterion,
where g(t) denotes the whole transmission channel impulse response

Let's the following $g(t)=h(t)*h_c(t)*h_r(t)$ be the impulse response of the whole transmission channel:



(T_s = symbol period)

QUESTION 2

The transmission channel:

A Respect the Nyquist criterion

B Can respect the Nyquist criterion

C Cannot respect the Nyquist criterion

D Not enough elements to answer the question

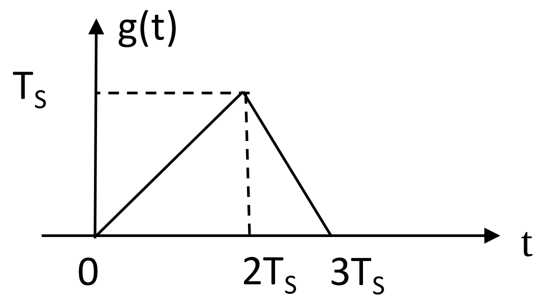
BAD ANSWER

Click here to CHANGE YOUR ANSWER

GOOD ANSWER

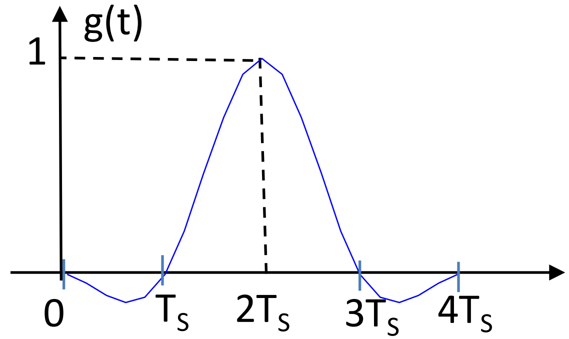
Click here for the FOLLOWING QUESTION

The Nyquist criterion $\begin{cases} g(t_0) \neq 0 \\ g(t_0 + pT_s) = 0 \; for \; p \in Z^* \end{cases}$ **cannot be respected here.**



It is not possible to find, with this g(t), a value for t_0 allowing to respect the criterion.

Let's the following $g(t)=h(t)*h_c(t)*h_r(t)$ be the impulse response of the whole transmission channel:



(T_s = symbol period)

QUESTION 3

The transmission channel:

A. Respect the Nyquist criterion

B. Can respect the Nyquist criterion

C. Cannot respect the Nyquist criterion

D. Not enough elements to answer the question

BAD ANSWER

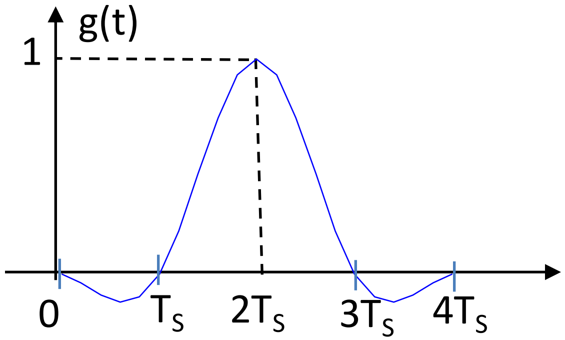
Click here to CHANGE YOUR ANSWER

GOOD ANSWER

Click [here]() for the FOLLOWING QUESTION

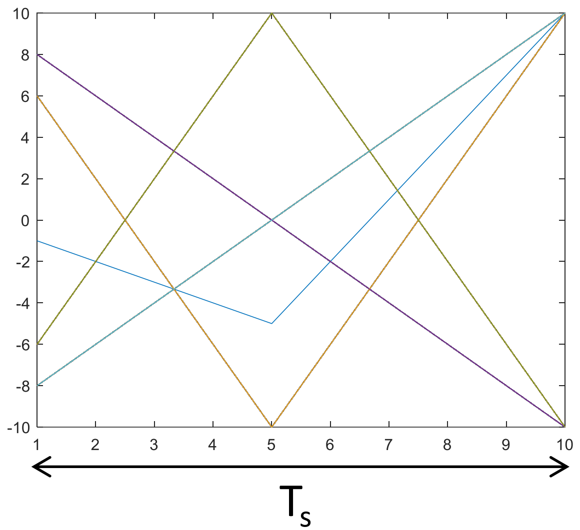
The Nyquist criterion can be respected IF we sample in the reveiver at time instants t_0+mT_s with $t_0=2T_s$

Then we obtain:



$$\begin{cases} g(t_0) \neq 0 \\ g(t_0 + pT_s) = 0 \; for \; p \in Z^* \end{cases}$$

We consider a transmission channel with binary and zero mean symbols a_k taking their values in {-1,+1}.
We give below the eyediagram which has been plotted, without noise, on the signal at the receiver filter output, on T_s duration (composed of 10 samples in digital):



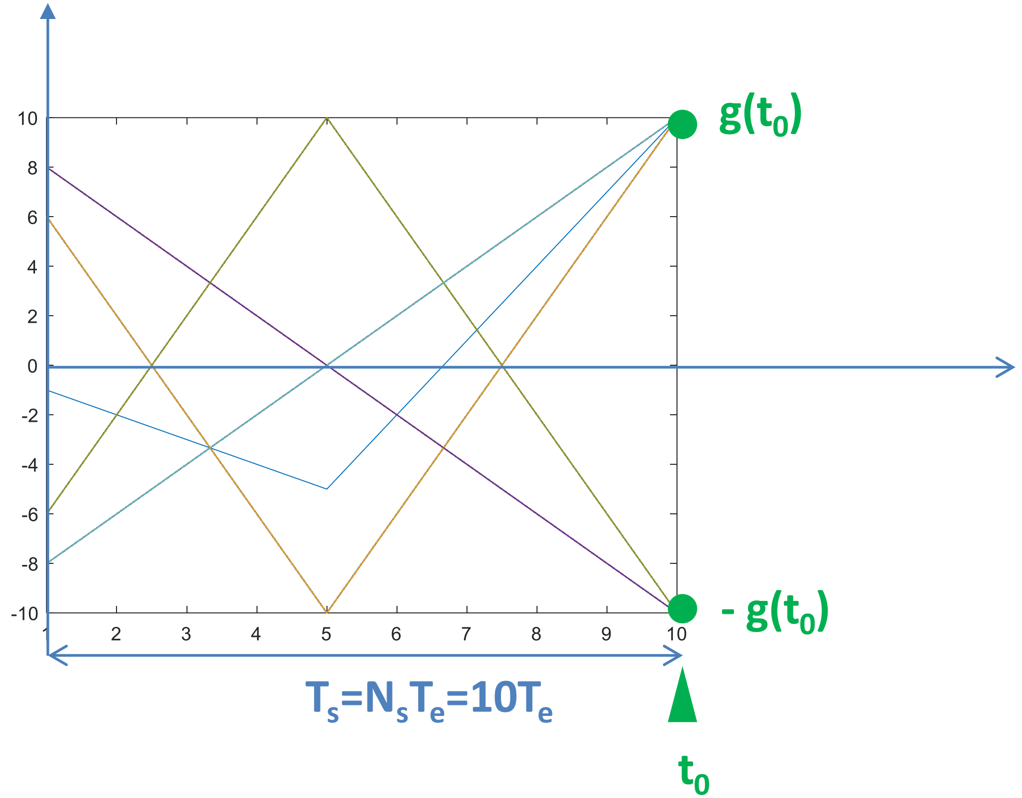
QUESTION 4

The transmission channel:

- A Can respect the Nyquist criterion
- B Cannot respect the Nyquist criterion
- C Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER



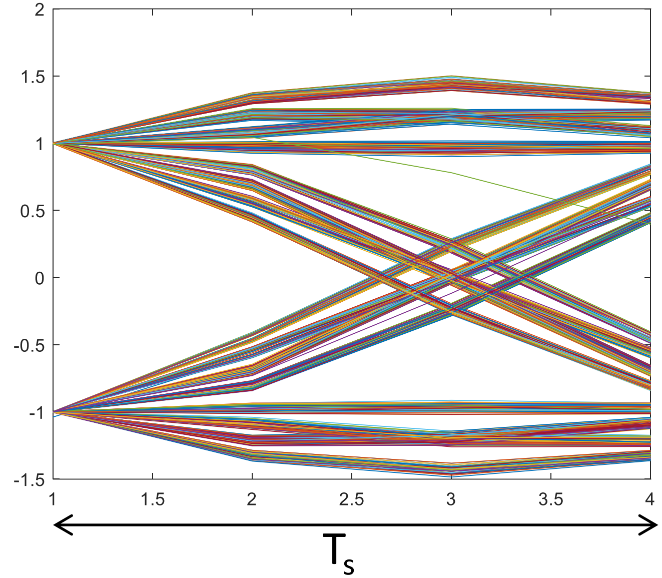
GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion can be veryfied if we sample at t_0+mT_s, with $t_0=10$ [(1)]
Indeed, at this time instants, we will only have 2 possible values whatever can happen in the signal during T_s (green circles). Knowing that the transmitted symbols can take 2 values, this means that there is no interference at these time instants. These two values are +/- $g(t_0)$= +/- $g(T_s)$ = +/- T_s= +/- 10 here.

[(1)] Note: considering digital signals, sampled at T_e, we sample in fact at N_s+mN_s, N_s representing the 10^{th} sample on T_s duration: $T_s=N_sT_e$, with, here, $N_s=10$. If we want to write t_0 in seconds, it is $10T_e$.

We consider a transmission channel with binary and zero mean symbols a_k taking their values in {-1,+1}. We give below the eyediagram which has been plotted, without noise, on the signal at the receiver filter output, on T_s duration (composed of 4 signal samples in digital):



QUESTION 5

The transmission channel:

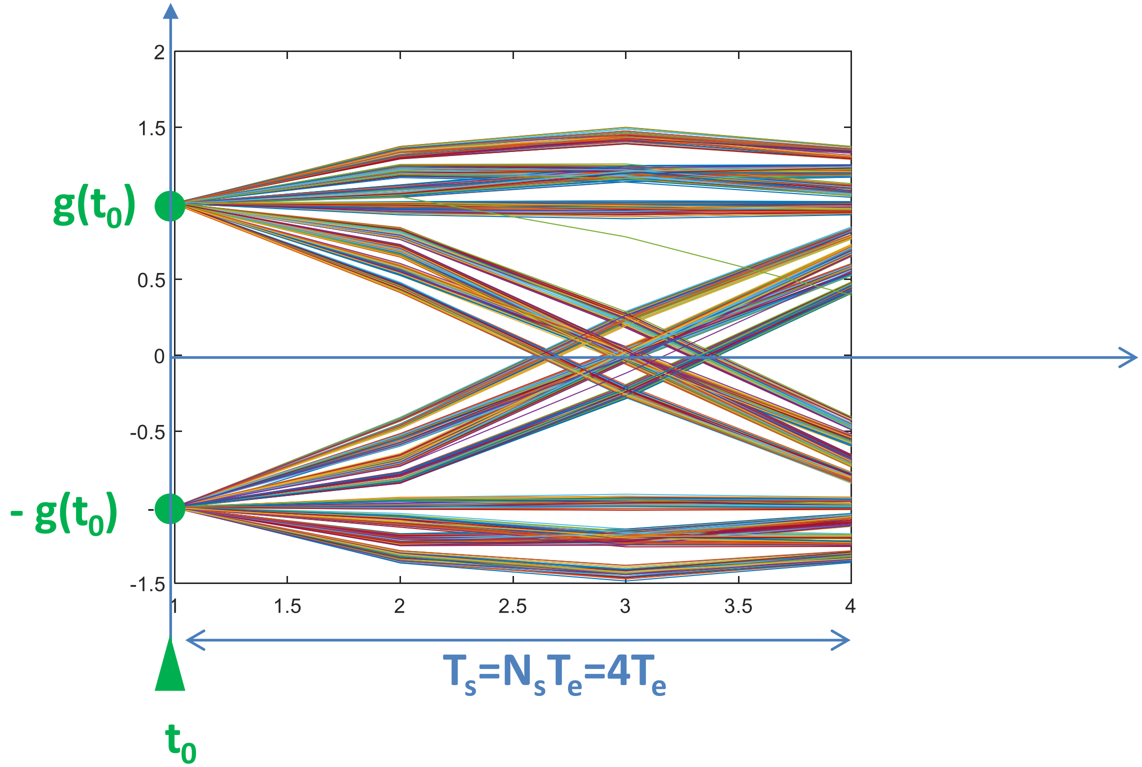
A Can respect the Nyquist criterion

B Cannot respect the Nyquist criterion

C Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER



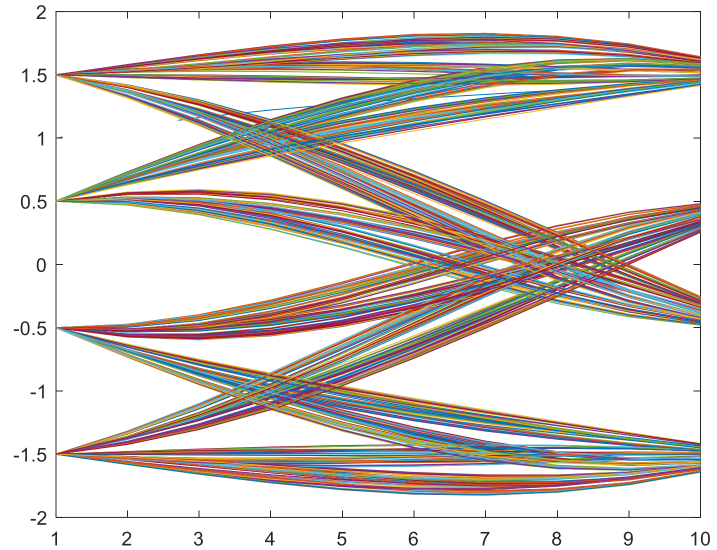
GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion can be veryfied if we sample at t_0+mT_s, with $t_0=1$ [(1)]
Indeed, at this time instants, we will only have 2 possible values whatever can happen in the signal during T_s (green circles). Knowing that the transmitted symbols can take 2 values, this means that there is no interference at these time instants. These two values are +/- $g(t_0)$= +/- $g(1)$ = +/- 1 here.

[(1)] Note: considering digital signals, sampled at T_e, we sample in fact at $1+mN_s$, N_s being the number of samples on T_s duration: $T_s=N_sT_e$, with, here, $N_s=4$. If we want to write t_0 in seconds, it is T_e.

We consider a transmission channel with binary and zero mean symbols a_k taking their values in {-1,+1}. We give below the eyediagram which has been plotted, without noise, on the signal at the receiver filter output, on T_s duration (composed of 10 samples):



QUESTION 6

The transmission channel:

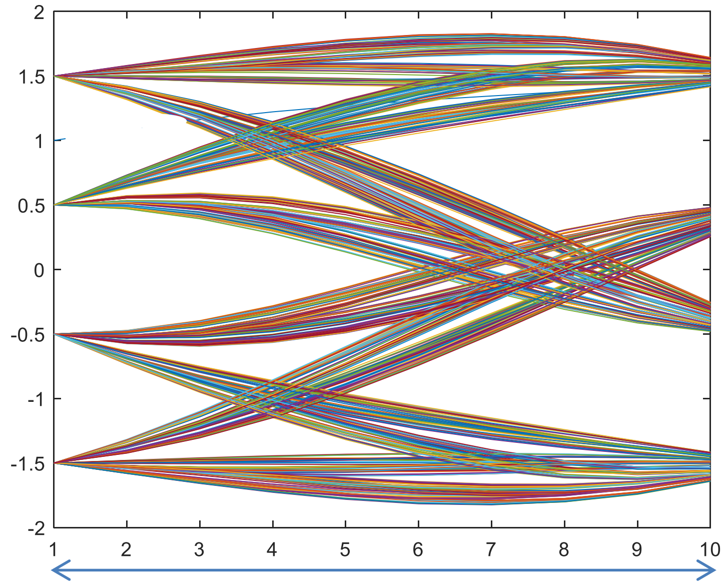
A Can respect the Nyquist criterion

B Cannot respect the Nyquist criterion

C Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER



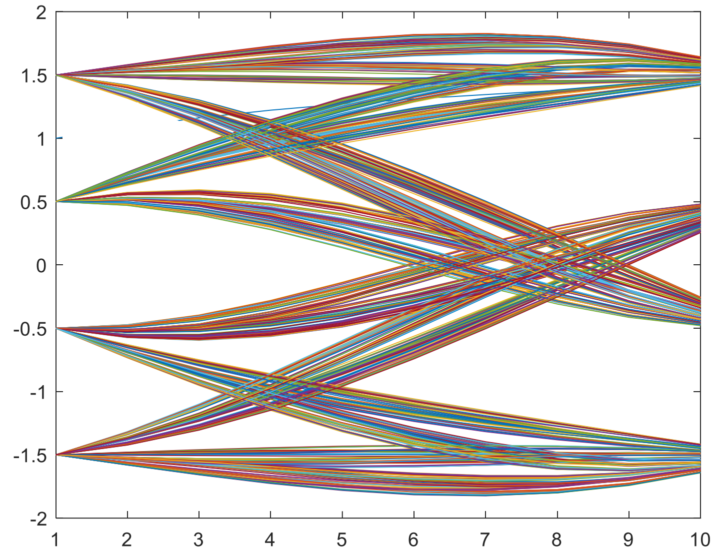
$T_s = N_s T_e = 10T_e$

GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion cannot be veryfied because it is not possible here to find a time instant in T_s where we retrieve only two possible values whatever can happen in T_s.
Knowing that the transmitted symbols can only take 2 values, this means that there isn't a time instant without inter symbol interference each T_s.

We consider a transmission channel with binary and zero mean symbols a_k taking their values in {-3, -1, +1, +3}. We give below the eyediagram which has been plotted, without noise, on the signal at the receiver filter output, on T_s duration (composed of 10 samples of signal in digital):



QUESTION 7

The transmission channel:

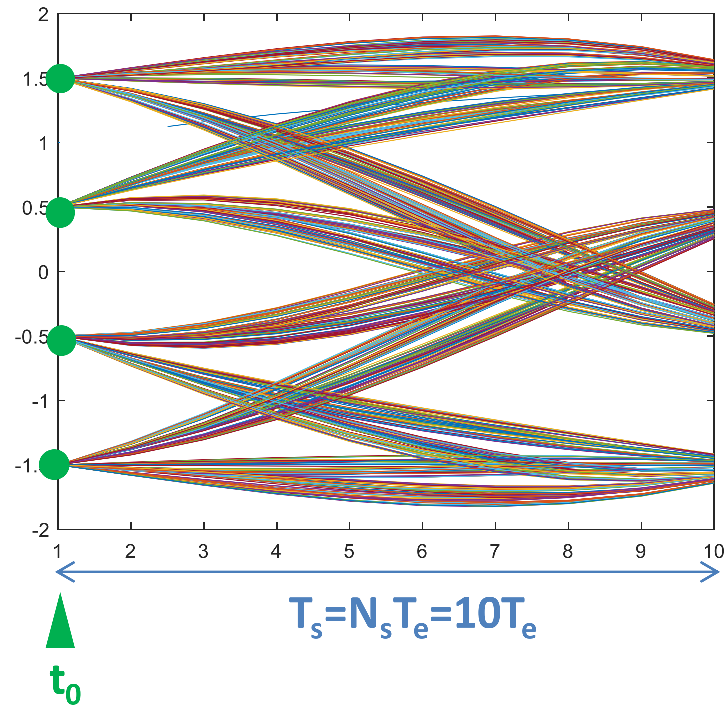
A. Can respect the Nyquist criterion

B. Cannot respect the Nyquist criterion

C. Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER



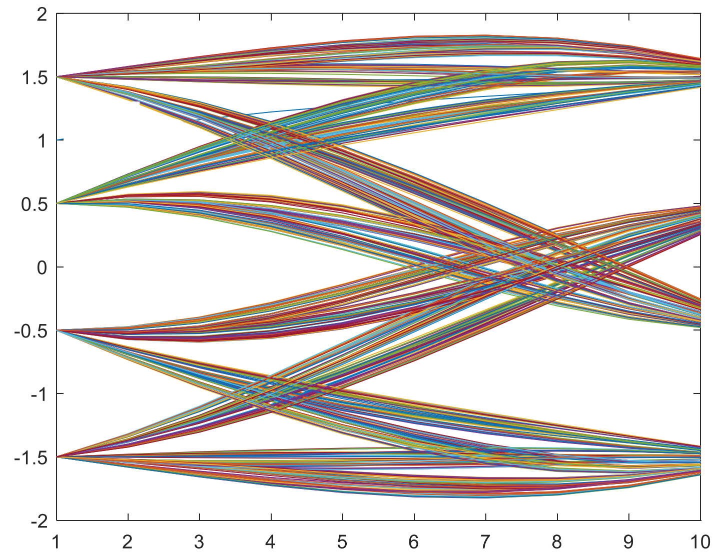
GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion can be veryfied if we sample at t_0+mT_s, with $t_0=1$ [(1)]
Indeed, at this time instants, we will only have 4 possible values whatever can happen in the signal during T_s (green circles). Knowing that the transmitted symbols can take 4 values, this means that there is no interference at these time instants.

[(1)] Note: considering digital signals, sampled at T_e, we sample in fact at $1+mN_s$, N_s being the number of samples on T_s duration: $T_s=N_sT_e$, with, here, $N_s=10$. If we want to write t_0 in seconds, it is T_e.

We consider a transmission channel with binary and zero mean symbols a_k taking their values in {-3, -1, +1, +3}. We give below the eyediagram which has been plotted, without noise, on the signal at the receiver filter output, on T_s duration (composed of 10 samples of signal in digital):



QUESTION 8

We sample at t_0+mT_s with $t_0=1$. If we denote g(t) the whole transmission channel impulse response, $g(t_0)$ equals here:

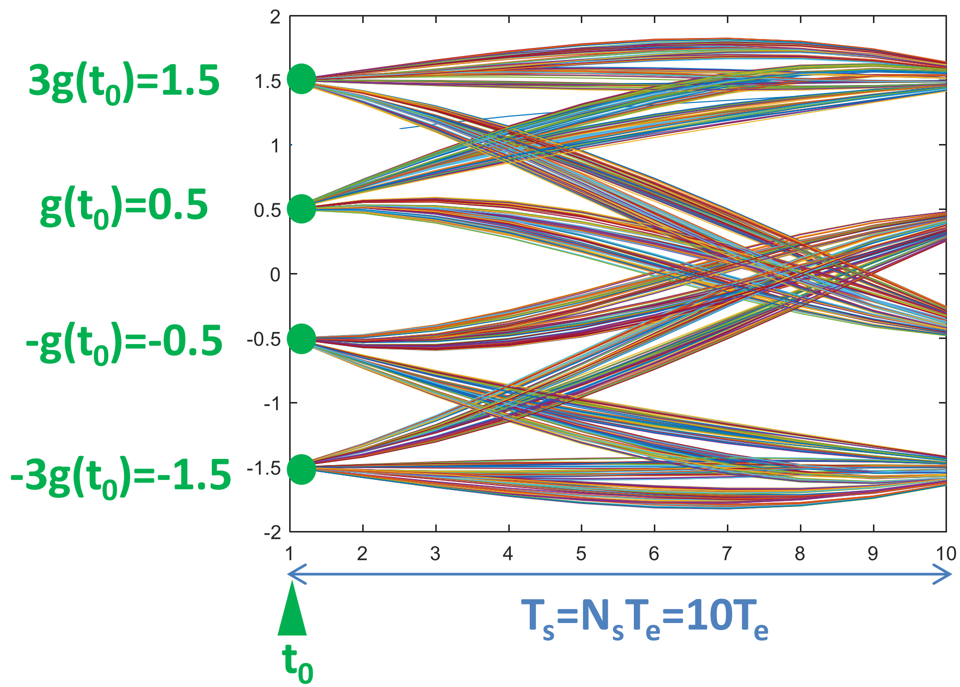
A Ns

B 1/2

C 1

BAD ANSWER

Click here CHANGE YOUR ANSWER

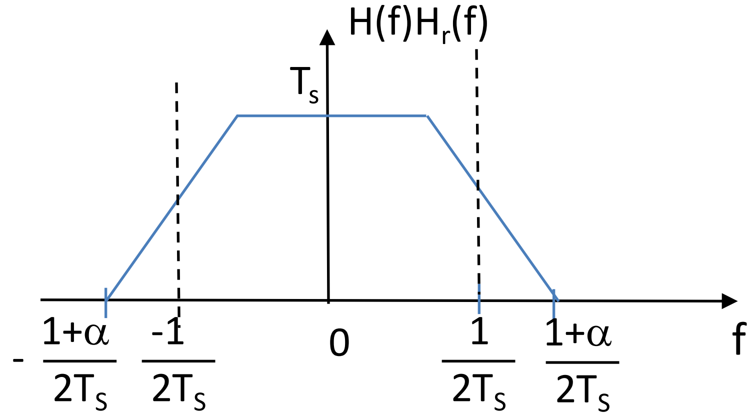


GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion is verified if we sample at t_0+mT_s, with $t_0=1$. Actually, we retrieve, at these time instants, only 4 possible values whatever can happen in the signal during T_s. As the transmitted symbols can take 4 values, it means that there is no ISI at these time instants. We then obtain, without noise: $a_kg(t_0)$, so (+/-)$g(t_0)$ and (+/-)$3g(t_0)$.
Here we can observe (+/-)0.5 and (+/-)1.5. So g(t0)=½.

We give the product $H(f)H_r(f)$, where $H(f)$ is the frequency response of the shaping filter and $H_r(f)$ is the frequency response of the receiver filter:



(T_s = symbol duration, $0<\alpha<1$))

QUESTION 9

The transmission channel:

A. Can respect the Nyquist criterion

B. Cannot respect the Nyquist criterion

C. Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER

GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion can be expressed in the frequency domain:

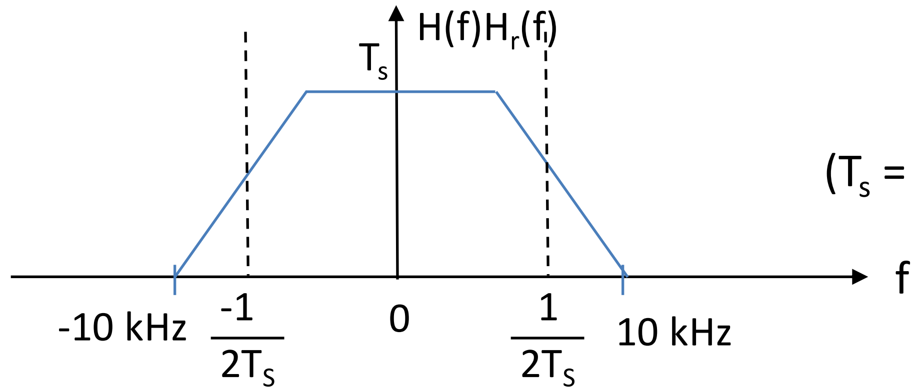
$$\sum_k G^{(t_0)}\left(f - \frac{k}{T_s}\right) = cte$$

It concerns $G(f)=H(f)H_c(f)H_r(f)$, where $H(f)$ is the frequency response of the shaping filter, $H_c(f)$ the frequency response of the propagation channel and $H_r(f)$ the frequency response of the receiver filter.

We know $H(f)H_r(f)$ but not $H_c(f)$,
Thus it is not possible to say if the Nyquist criterion can be respected or not.

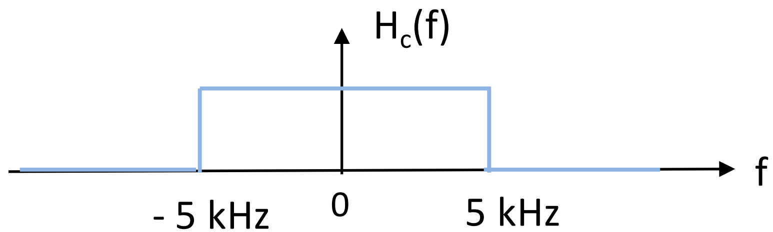
Note: $G^{(t0)}(f)$ is the Fourier transform of $g(t)$ centered around 0 and normalized.

We give the product $H(f)H_r(f)$, where $H(f)$ is the frequency response of the shaping filter and $H_r(f)$ is the frequency response of the receiver filter:



(T_s = symbol duration)

And the frequency response of the propagation channel, assumed to be AWGN with a limited bandwidth:



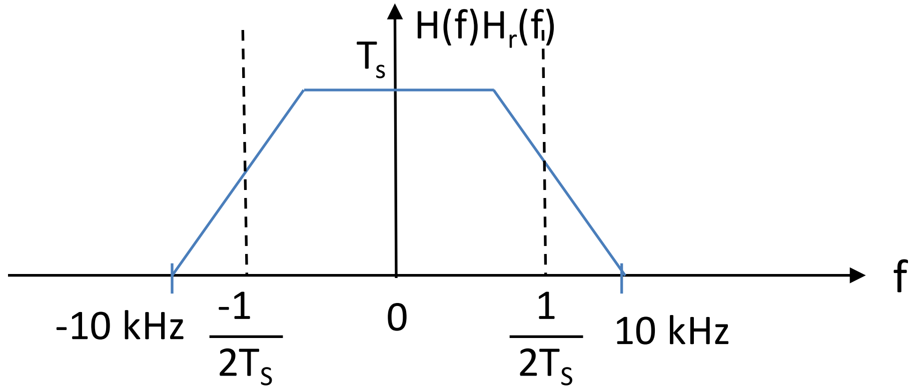
QUESTION 10

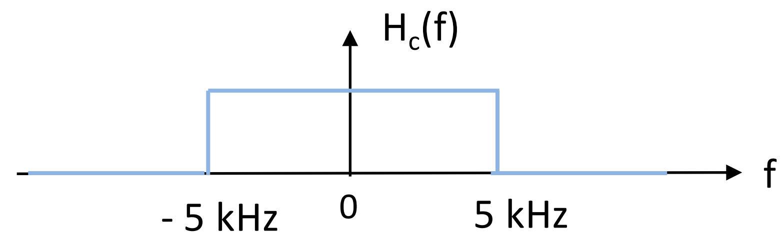
The transmission channel:

- A — Can respect the Nyquist criterion
- B — Cannot respect the Nyquist criterion
- C — Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER





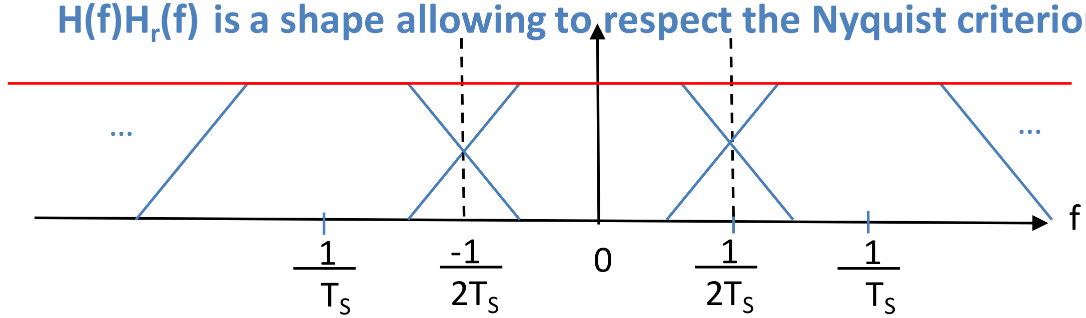
GOOD ANSWER

Click [here] for the FOLLOWING QUESTION

The Nyquist criterion in the frequency domain concerns $G(f)=H(f)H_c(f)H_r(f)$:

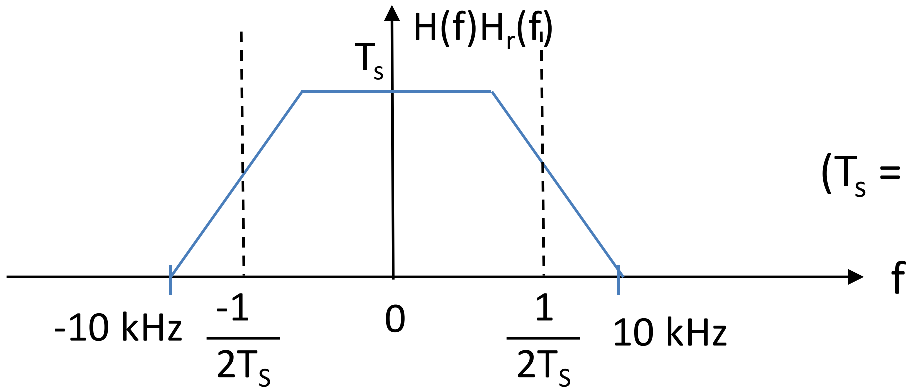
$$\sum_k G^{(t_0)}\left(f-\frac{k}{T_s}\right)=cte$$

$H(f)H_r(f)$ is a shape allowing to respect the Nyquist criterion:



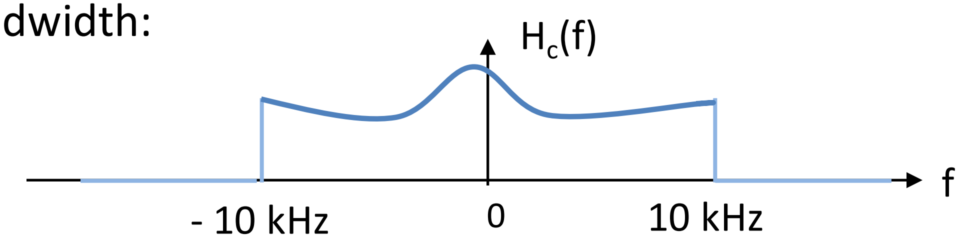
To go on respecting it with $H_c(f)$ we need the channel bandpass to include the bandwidth of $H(f)H_r(f)$. This is not the case here, thus the Nyquist criterion cannot be respected in this transmission channel.

We give the product $H(f)H_r(f)$, where $H(f)$ is the frequency response of the shaping filter and $H_r(f)$ is the frequency response of the receiver filter:



(T_s = symbol duration)

And the frequency response of the propagation channel, assumed to be AWGN with a limited bandwidth:



QUESTION 11

The transmission channel:

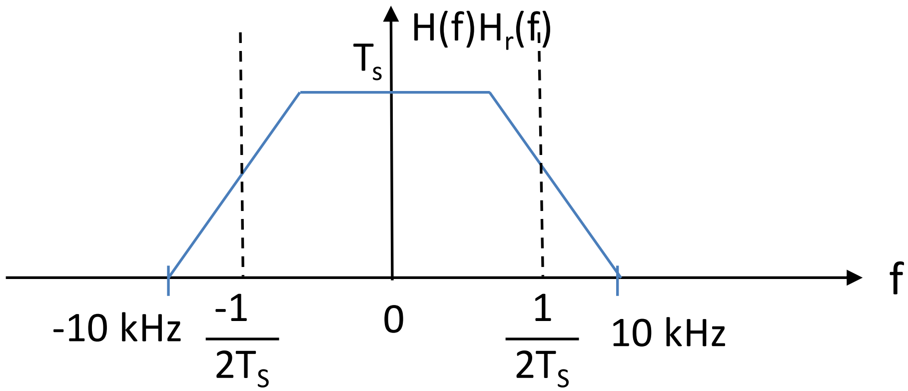
A Can respect the Nyquist criterion

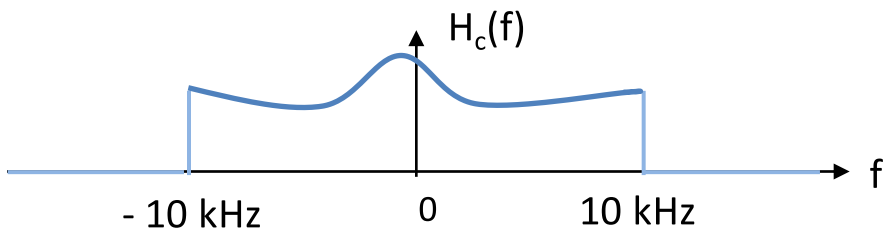
B Cannot respect the Nyquist criterion

C Not enough elements to answer the question

BAD ANSWER

Click here to CHANGE YOUR ANSWER





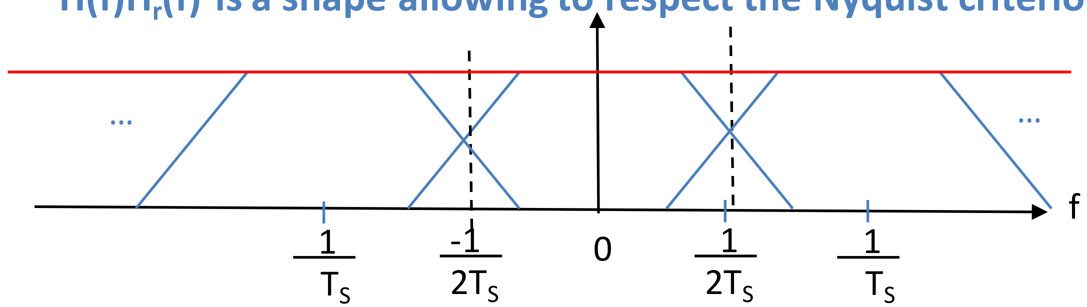
GOOD ANSWER

Click here for the FOLLOWING QUESTION

The Nyquist criterion in the frequency domain concerns $G(f)=H(f)H_c(f)H_r(f)$:

$$\sum_k G^{(t_0)}\left(f - \frac{k}{T_s}\right) = cte$$

$H(f)H_r(f)$ is a shape allowing to respect the Nyquist criterion:



With $H_c(f)$ it is not possible to respect it anymore. Indeed, the shape of $H(f)H_r(f)$ allowing to respect the criterion is modified when multiplied by $H_c(f)$ and the shape obtained for $H(f)H_c(f)H_r(f)$ does not allow to respect the Nyquist criterion anymore.

THE QUIZ IS FINISHED