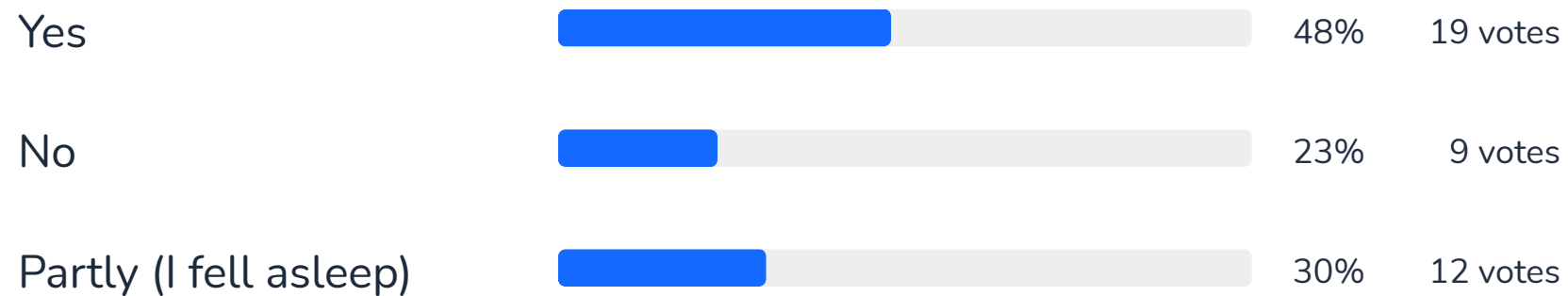


VIB2021 : Vibration sources and Fourier Analysis

Number of participants: 57

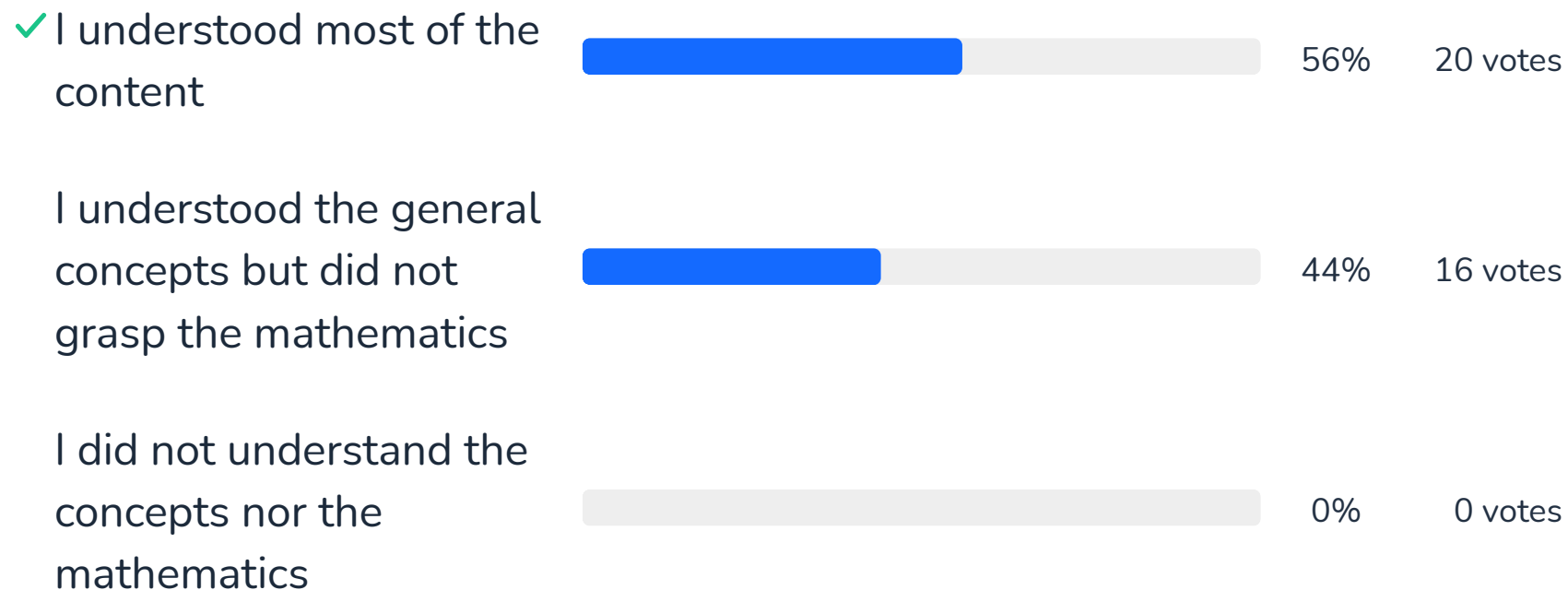
1

I have watched the video on vibration sources before coming to the class




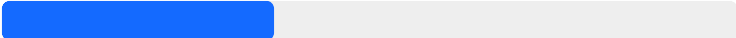

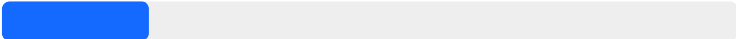
2

After watching the video I think that



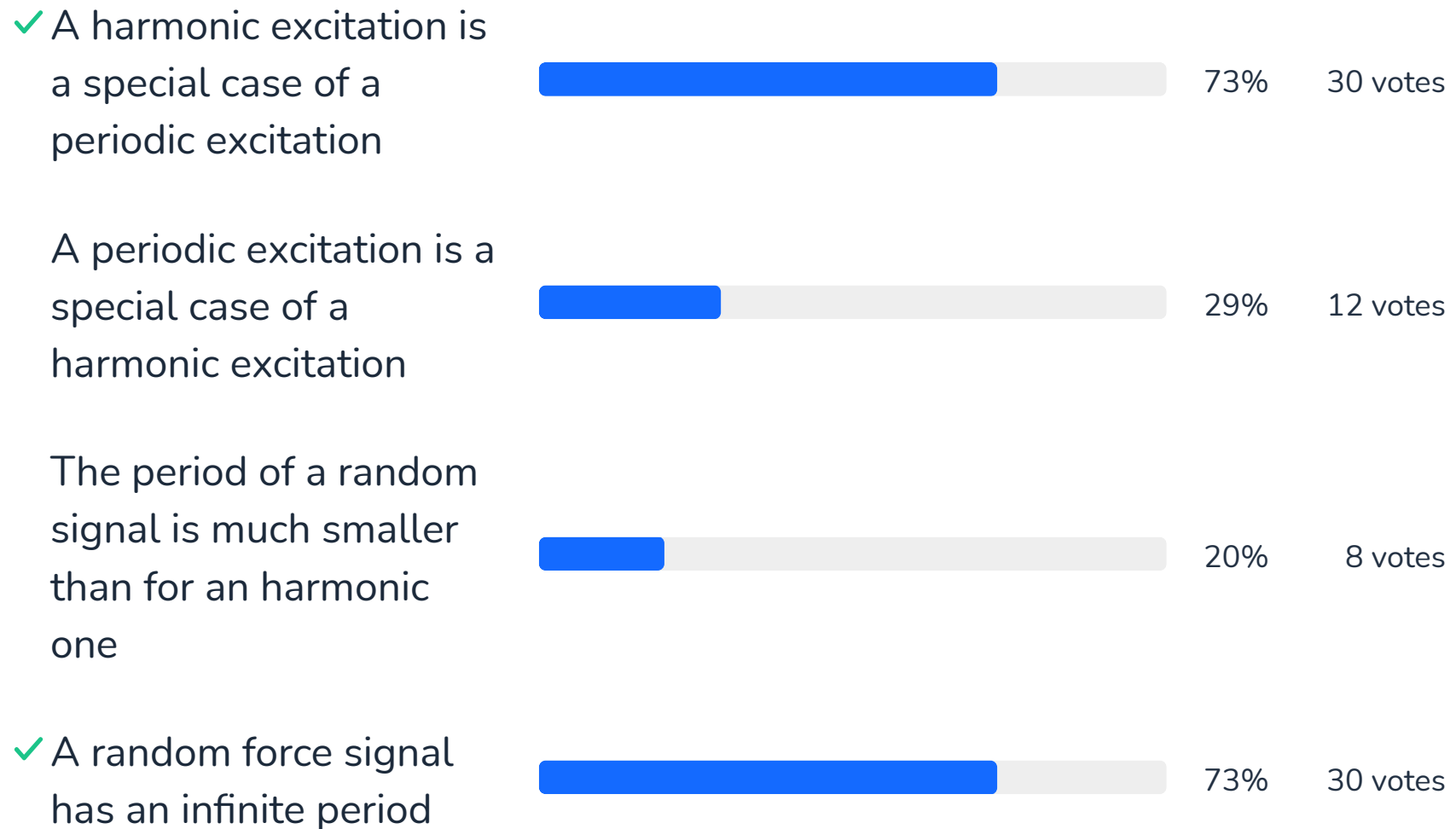
3

The following are examples of free mechanical vibrations

✓ A bell ringing		59%	24 votes
A worker using a jack hammer		37%	15 votes
✓ The bar of a football goal vibrating after being hit by a ball		78%	32 votes
Vibrations due to a spinning washing machine		20%	8 votes

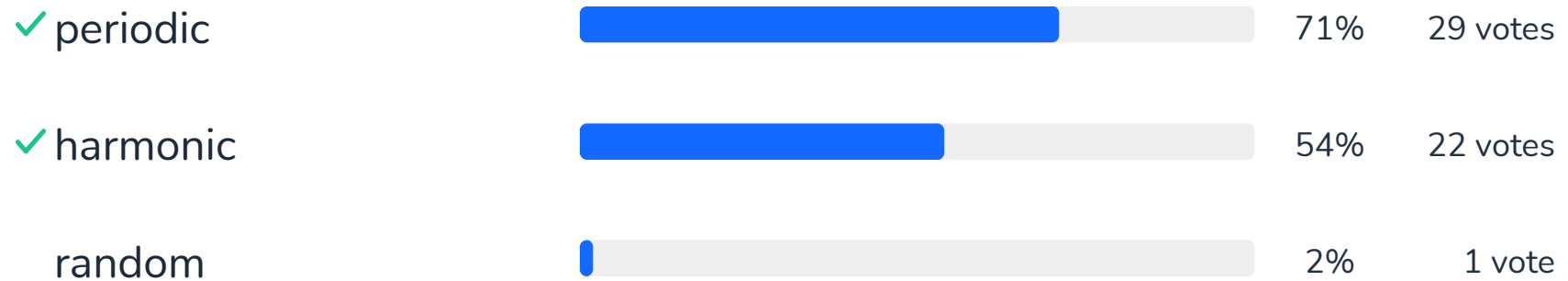
4

Which of the following statements are true ?



5

A rigid rotating machine induces a force
that is



6

Any rotating machine produces a

harmonic force



27%

10 votes

✓ periodic force



70%

26 votes

random force

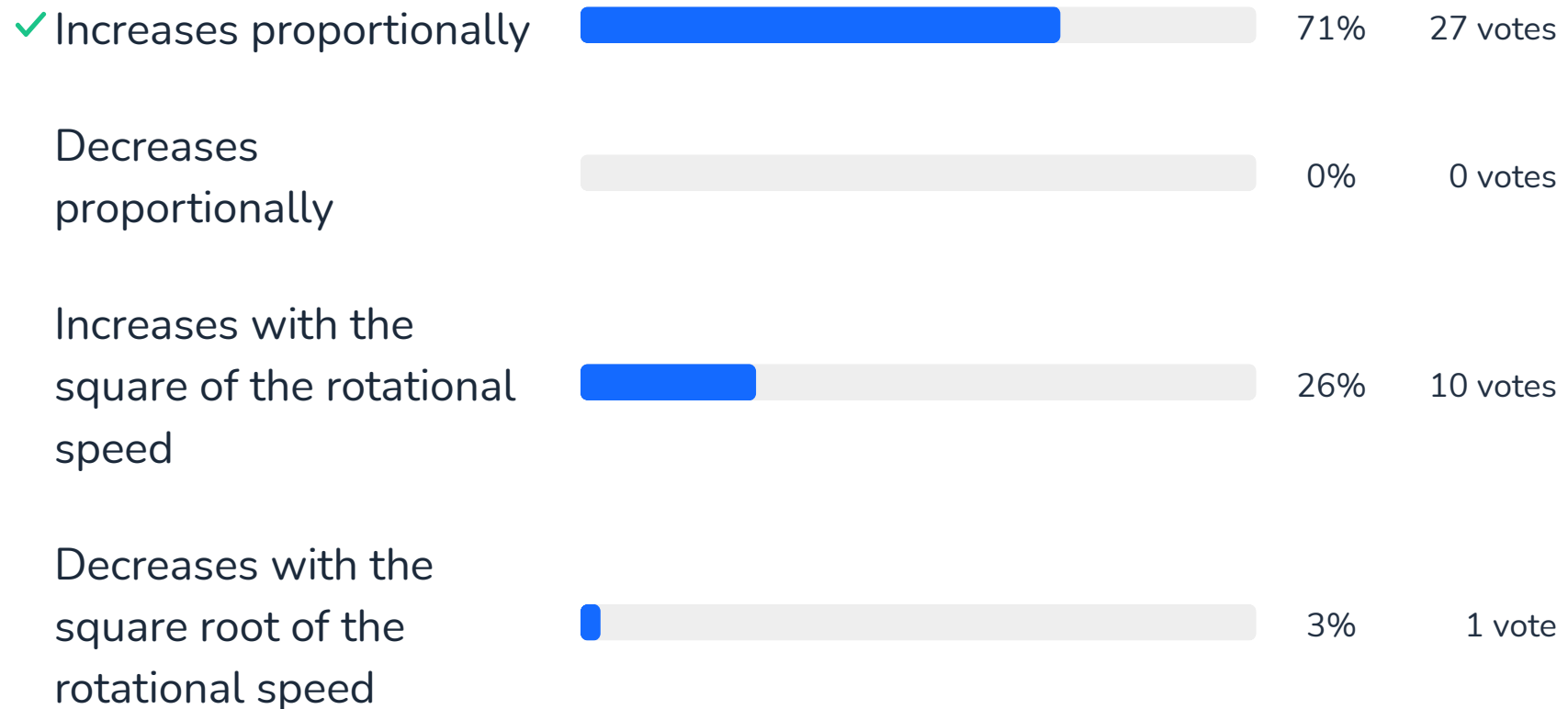


3%

1 vote

7

When the rotational speed of a machine increases, the frequency of the forces produced



8

The force applied by a pedestrian walking or running at constant speed on a bridge is

harmonic



22%

9 votes

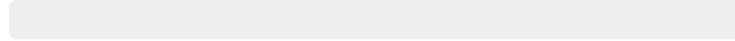
✓ periodic



78%

32 votes

random

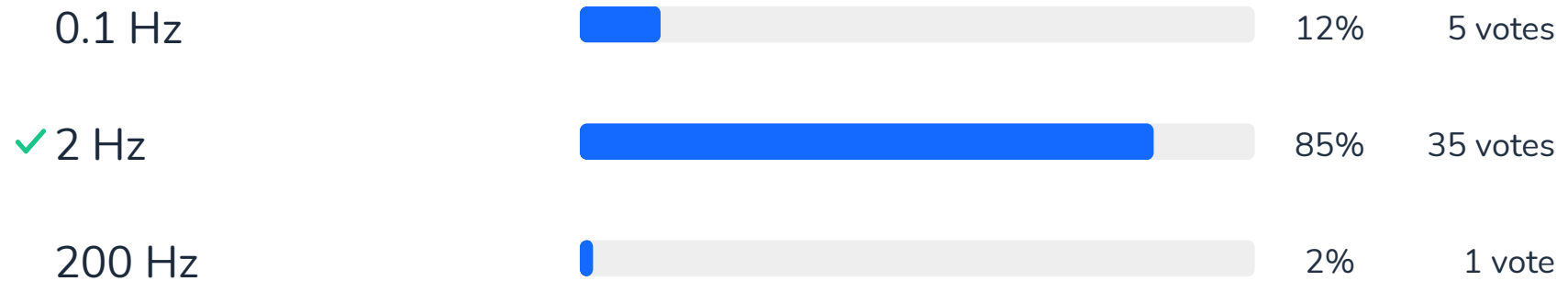


0%

0 votes

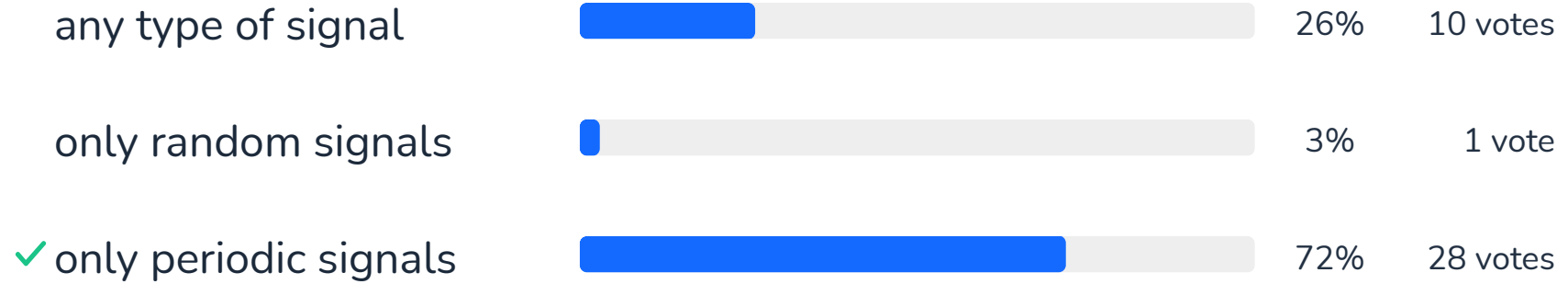
9

The main frequency of excitation for walking pedestrians is around



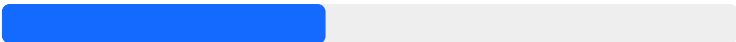
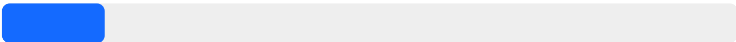

10

The discrete Fourier transform applies to




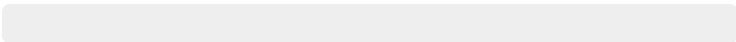
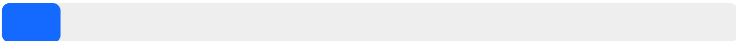
11

The discrete Fourier transform computes amplitudes of sine and cosine functions at frequencies which are

- ✓ multiples of the fundamental angular frequency = $2\pi/T$
 44% 16 votes
- odd multiples of the fundamental frequency = $2\pi/T$
 14% 5 votes
- ✓ multiples of the fundamental frequency = $1/T$
 64% 23 votes


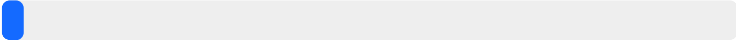
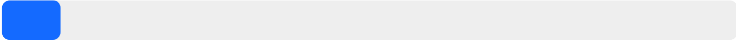

12

It is interesting to transform an excitation signal from the time domain to the frequency domain because

- ✓ It provides information about the main frequencies of excitation which could cause structural resonance  92% 35 votes
- The signal is more compact in the frequency domain  0% 0 votes
- It is easier to add signals in the frequency domain  8% 3 votes

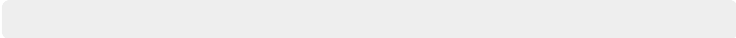
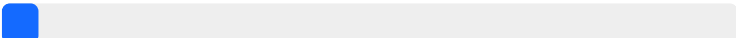

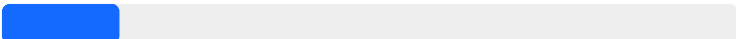
13

The continuous Fourier transform applies to

✓ any type of signal		89%	33 votes
periodic signals only		3%	1 vote
harmonic signals only		8%	3 votes
it depends on the type of excitation of the system		0%	0 votes


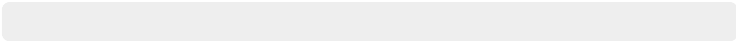

14

The continuous Fourier transform of a rectangle (pulse) is

a cosine function		0%	0 votes
a sine function		5%	2 votes
✓ a sinc function		79%	30 votes
a complex function which cannot be computed analytically		16%	6 votes


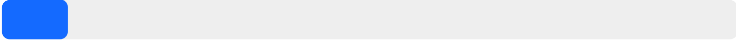
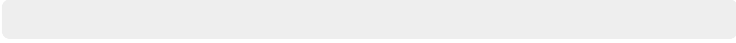
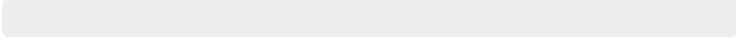
15

For a SDOF system (and MDOF), the
Fourier transform of the impulse
response $h(t)$

✓ allows to extract the information about the natural frequency		49%	17 votes
cannot be computed analytically		0%	0 votes
✓ is the transfer function $X(\omega)/F(\omega)$		71%	25 votes

16

Convolution in the time domain corresponds to

✓ multiplication in the frequency domain		91%	32 votes
convolution in the frequency domain		9%	3 votes
deconvolution in the frequency domain		0%	0 votes
division in the frequency domain		0%	0 votes

17

Aliasing happens when

The sampling frequency is too high with respect to the frequency content of the signal



10%

4 votes

✓ The sampling frequency is too low with respect to the frequency content of the signal



85%

33 votes

The sampling frequency is equal to the frequency content of the signal



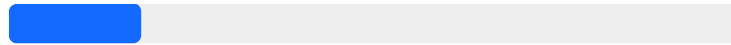
5%

2 votes

18

The continuous Fourier transform of a sampled signal is

Discrete and periodic



18%

6 votes

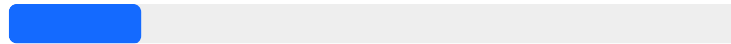
✓ Continuous and periodic



65%

22 votes

Discrete with the same
number of samples as
the original signal



18%

6 votes

19

When using Fast Fourier Transform on sampled signals, you can increase the frequency resolution by

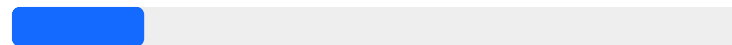
decreasing the time step
of the sampling signal,
keeping the total
measurement time
constant



53%

18 votes

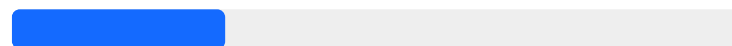
increasing the time step
of the sampling signal,
keeping the total
measurement time
constant



18%

6 votes

✓ increasing the
measurement time,



29%

10 votes

whatever the time step
of the sampling signal

20

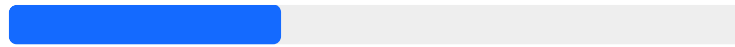
When using DFT, the time step of the sample signal has an influence on

The frequency resolution of the DFT



53% 16 votes

✓ The maximum frequency of the F-DFT



37% 11 votes

It has no influence on the DFT

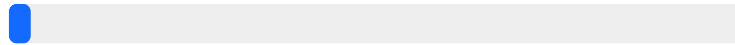


10% 3 votes

21

Suppose the sampling frequency of the accelerometer on your smartphone is 200 Hz. Up to what frequency can you measure acceleration signals ?

200 Hz



3%

1 vote

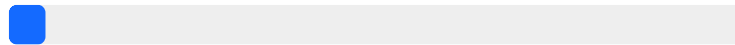
✓ 100 Hz



92%

34 votes

It depends on the length
of the measurement



5%

2 votes

