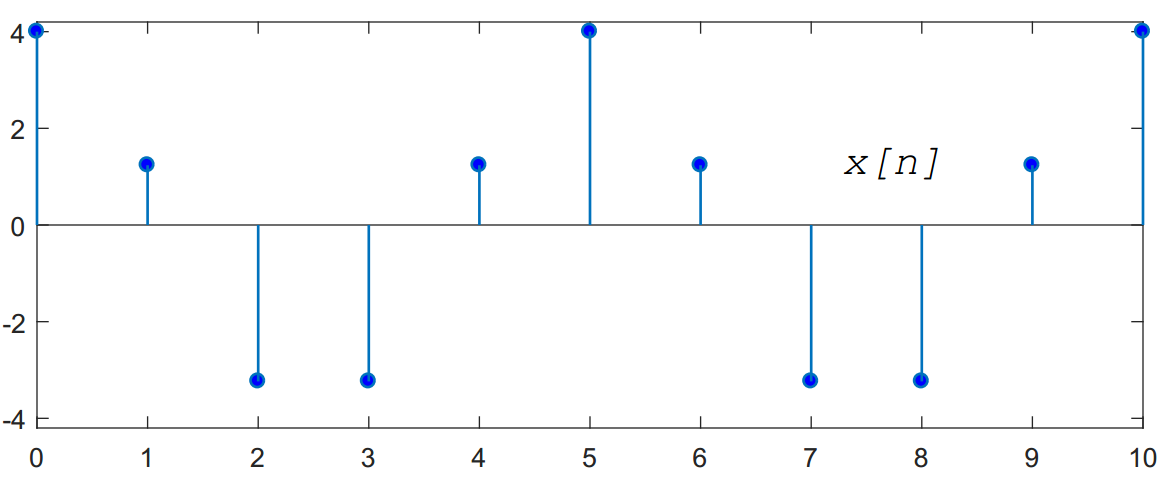
a)

*(Reader sketches the signal by yourself)*

b)

Sampling time:

Sampled signal:



Given that:

a) Check for linearity:

Let:

From and , , the system is linear.

a) Check for time invariant:

Let:

(delay the ouput).

Let:

Since, , therefore, the system is time variant.

b)

Assume that is finite for all .

We have:

Therefore, with bounded input, the output will be bounded, which leads to the system is BIBO system.

a) Given that:

Compare and , we obtain:

Given that:

Therefore,

b)

From the given and , we have the following convolution table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Using this convolution table, we obtain the result:

+

+

+

+

+

+

+

Therefore,

Given that:

a)

Chart

Description automatically generated

For , and does not overlap .

For :

Thus,

b)

With

For

By properties of LTI system, the output is given by:

a)

From , we obtain homogeneous equation:

Therefore, the characteristic polynomial:

Let:

Thus, the natural response is:

b)

For , equivalent with:

Assume that the forced response has the form: .

Substitute into the above equation:

Therefore, the total response is:

With the initial conditions:

Thus, the total response the system is: