a)

Rewrite as unit step function we have:

Therefore,

b)

a)

Given that:

To find transfer function, we set all initial condition to 0.

Taking Laplace transform both sides of , we obtain:

Therefore, the transfer function is:

From the transfer function we obtain 1 zero and 2 poles, which are: ,

. (put those three point in the complex system coordinates we obtain the pole-zero plot, reader plot by yourself).

b)

Given that:

Let , it holds that:

Taking Laplace transform both sides of , we obtain:

Thus, the solution of the given differential equation is:

Given that:

Let , it holds that:

Taking -transform both side of , we obtain:

Thus, the solution of the given system difference equations is:

a)

Due to odd function, we obtain:

The Fourier series is given by:

b)

By Parseval’s identity we obtain:

Due to odd function, we obtain:

The Fourier series is given by:

a)

b)