Experiment 19
Pole–Zero Plot from the Transfer Function

Aim

To plot the poles and zeros of a transfer function when the coefficients of the transfer function are given.

Theory

The Z domain transfer function is useful for finding the stability of a system. If we know the coefficients of numerator and denominator polynomials, we can calculate the roots of these polynomials, namely, zeros and poles, respectively. If the poles are within the unit circle in Z domain then the system is a stable system.

Experiment

In MATLAB we make use of functions, namely, `tf2zp`, that is, transfer function to zeros and poles and `zp2tf`, that is, zeros and poles to transfer function. In the experiment, we enter the numerator and denominator coefficients of the transfer function, use `zp2tf` to get poles and zeros and plot the results (Figure 1). The MATLAB program is as follows.

```
%to plot poles and zeros knowing the transfer function
clear all;
num=[1 2 1];
den=[1 1 2 1];
[z,p,k]=tf2zp(num,den);
zplane(z,p);
```
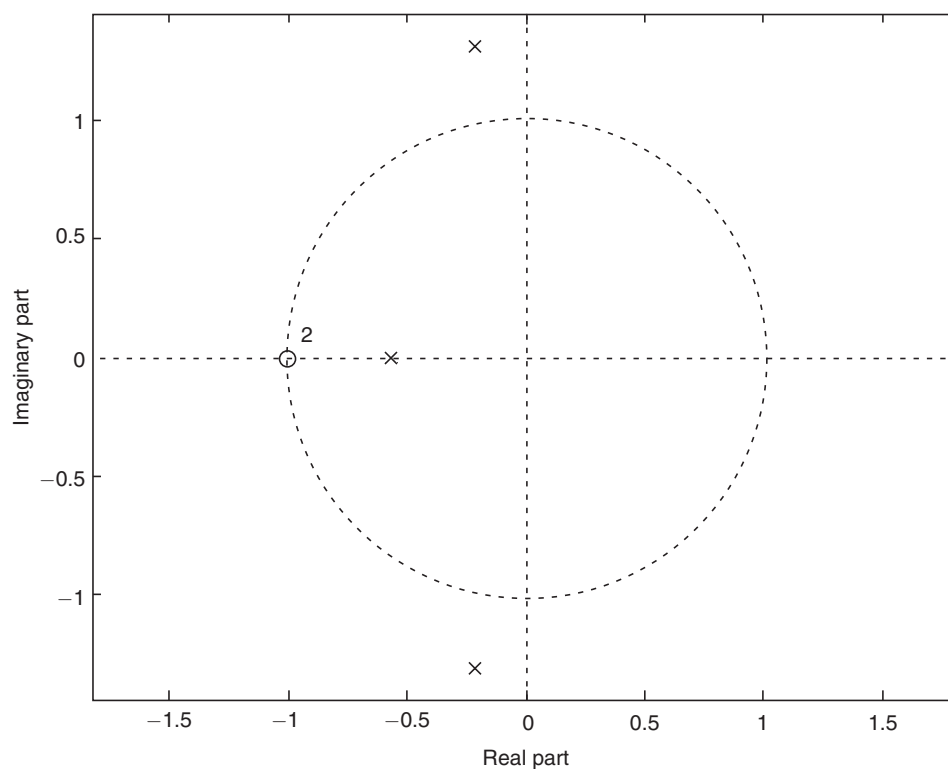
Figure 1 Plot of the zeros of poles of a transfer function in Z domain.