1 .TRANSFER FUNCTION FROM ZEROS AND POLES

AIM:

To obtain a transfer function from given poles and zeroes using MATLAB

APPARATUS:

Software: MATLAB

THEORY:

A transfer function is also known as the network function is a mathematical representation, in terms of spatial or temporal frequency, of the relation between the input and output of a (linear time invariant) system. The transfer function is the ratio of the output Laplace Transform to the input Laplace Transform assuming zero initial conditions. Many important characteristics of dynamic or control systems can be determined from the transfer function.

The transfer function is commonly used in the analysis of single-input single-output electronic system, for instance. It is mainly used in signal processing, communication theory, and control theory. The term is often used exclusively to refer to linear time-invariant systems (LTI). In its simplest form for continuous time input signal x(t) and output y(t), the transfer function is the linear mapping of the Laplace transform of the input, X(s), to the output Y(s).

Zeros are the value(s) for z where the numerator of the transfer function equals zero. The complex frequencies that make the overall gain of the filter transfer function zero. Poles are the value(s) for z where the denominator of the transfer function equals zero. The complex frequencies that make the overall gain of the filter transfer function infinite.

The general procedure to find the transfer function of a linear differential equation from input to output is to take the Laplace Transforms of both sides assuming zero conditions, and to solve for the ratio of the output Laplace over the input Laplace.

MATLAB PROGRAM:

```
z=input('enter zeroes')

p=input('enter poles')

k=input('enter gain')
```

[num,den]=zp2tf(z,p,k)

tf(num,den)

PROCEDURE:

- Write MATLAB program in the MATLAB editor document.
- Then save and run the program.
- Give the required input.
- The syntax "zp2tf(z,p,k)" and "tf(num,den)" solves the given input poles and zeros and gives the transfer function.
- zp2tf forms transfer function polynomials from the zeros, poles, and gains of a system in factored form.

Now find the output theoretically for the given transfer function and compare it with the output obtained practically

EXAMPLE:

Given poles are -3.2+j7.8,-3.2-j7.8,-4.1+j5.9,-4.1-j5.9,-8 and the zeroes are -0.8+j0.43,-0.8-j0.43,-0.6 with a gain of 0.5

THEORITICAL CALCULATIONS:

Enter zeros

Z =

Enter poles

P =

Enter gain

K=

num =

den =

Transfer function=

RESULT: