ASSIGNMENT

Z-TRANSFORM

NAME | COURSE_NAME LAB-NAME| DATE

Z - Transform of a Signal: -

The relationship between a discrete-time signal x[n] and its one-sided z-transform X(z) is expressed as follows:

$$X(Z)=\sum_{n=-\infty}^{\infty} x(n)z^{-n} \text{ (Transform equation)}$$

$$x(n)=(1/2\pi j) \int X(z)\, z^{n-1}dz \text{ (Inverse equation)}$$

Signal processing, the Z-transform converts a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency-domain representation.

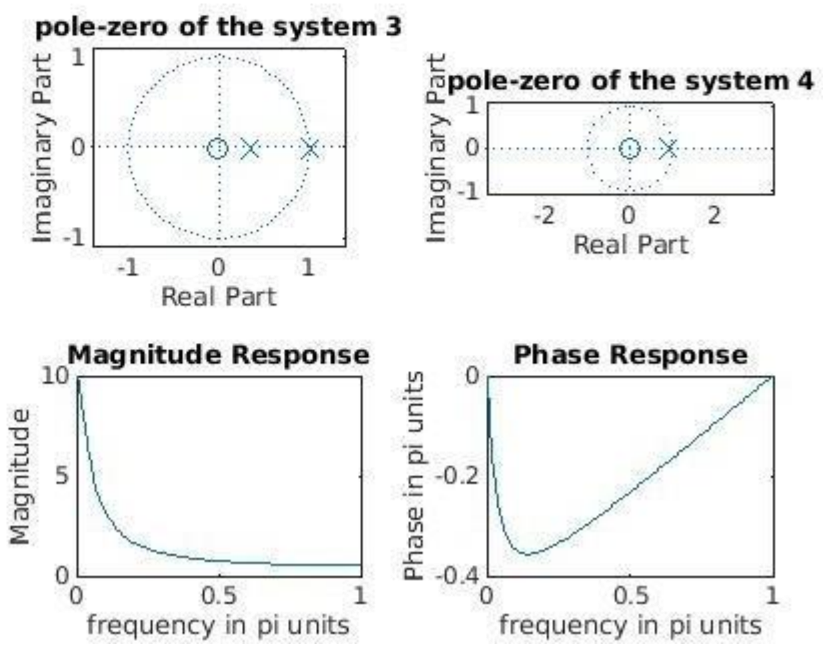
It can be considered as a discrete-time equivalent of the Laplace transform.

Conclusion: -

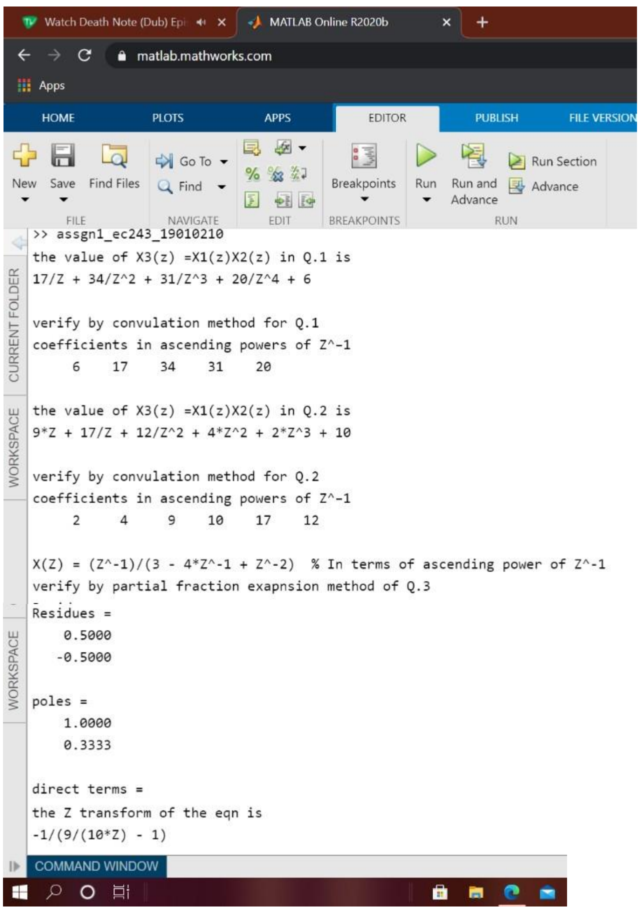
With the z-transform, we can create transfer functions for digital filters, and we can plot poles and zeros on a complex plane for stability analysis. The inverse z-transform allows us to convert a z-domain transfer function into a difference equation that can be implemented in code written for a microcontroller or digital signal processor.

MATLAB OUTPUT: -

- The plot of the various signal in the assignment question is given below: -



- The Z - transform is given below: -



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>> assgn1_ec243_19010210
the value of X3(z) =X1(z)X2(z) in Q.1 is
17/Z + 34/Z^2 + 31/Z^3 + 20/Z^4 + 6

verify by convulation method for Q.1
coefficients in ascending powers of Z^-1
     6    17    34    31    20

the value of X3(z) =X1(z)X2(z) in Q.2 is
9*Z + 17/Z + 12/Z^2 + 4*Z^2 + 2*Z^3 + 10

verify by convulation method for Q.2
coefficients in ascending powers of Z^-1
     2     4     9    10    17    12

X(Z) = (Z^-1)/(3 - 4*Z^-1 + Z^-2)  % In terms of ascending power of Z^-1
verify by partial fraction exapnsion method of Q.3
Residues =
    0.5000
   -0.5000

poles =
    1.0000
    0.3333

direct terms =
the Z transform of the eqn is
-1/(9/(10*Z) - 1)
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