3. z-Transform

Aim: To determine the z-Transform of given sequences using MATLAB.

1.

Let $X_1(Z) = 1 + 2Z^{-1} + 3Z^{-2}$ and $X_2(Z) = 1 + 3Z^{-1} + 4Z^{-2}$. Determine the following using MATLAB.

$X_3(Z) = X_1(Z)X_2(Z)$

2.

Write a MATLAB program to find Z-transform of the following causal signals.
   a) 0.5^n b) n c) na^n

```
clear all;
syms n a real; %Let n be real variable
% a)
x1=0.5^n;
disp('z-transform of "0.5^n" is') ;
X1 =ztrans(x1)
% b)
x2=n;
disp('z-transform of "n" is') ;
X2 =ztrans(x2)
% c)
x3=n*(a^n);
disp('z-transform of "n*(a^n)" is') ;
X3 =ztrans(x3)
```

3.

Given a causal system , $y(n) = 0.9y(n-1) + x(n)$. Determine the following using MATLAB
   i) $H(z)$ and sketch its pole-zero plot.
   ii)   The impulse response $h(n)$.

```
clear all;
syms n real;
syms z complex;
b = [1, 0];
a = [1, -0.9];
zplane(b,a);
H=1/(1-0.9*(z^(-1)));
```

```
disp('Impulse response h(n) is');
h=iztrans(H)   %compute impulse response
```

4.

Write a MATLAB program to find inverse Z-transform of the following z-domain signal.

$$X(Z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$

5.

Write a MATLAB program to perform convolution of signals,
$x_1(n) = (0.3)^n u(n)$ and $x_2(n) = (0.9)^n u(n)$ using Z-transform, and extract
$x_1(n)$ and $x_2(n)$ using deconvolution.

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