**ARYAMAN MISHRA**

**19BCE1027**

clc

clear all

format compact

syms p(n) z pZT

assume(n>=0 & in(n,'integer'))

a=input('Enter the coefficient of p\_n+2:')

b=input('Enter the coefficient of p\_n+1:')

c=input('Enter the coefficient of p\_n:')

G=input('Enter the RHS function:') %non homogeneous part

f=a\*p(n+2)+b\*p(n+1)+c\*p(n)-G

fZT = ztrans(f,n,z)

fZT = subs(fZT,ztrans(p(n),n,z),pZT)

pZT = solve(fZT,pZT)

pSol = iztrans(pZT,z,n)

pSol = simplify(pSol)

a=input('Enter the value of p\_0:');

b=input('Enter the value of p\_1:');

disp('Solution of the difference equation is given by:')

pSol= subs(pSol,[p(0) p(1)],[a b])

nValues = 1:10;

pSolValues = subs(pSol,n,nValues);

pSolValues = double(pSolValues);

pSolValues = real(pSolValues);

stem(nValues,pSolValues)

grid on

C:\Users\aryam\Desktop\Winter Sem 2021-22\Applications of Differential Equations Lab\19-5-21\MicrosoftTeams-image.png

Enter the coefficient of p\_n+2:1

a =

1

Enter the coefficient of p\_n+1:-5

b =

-5

Enter the coefficient of p\_n:6

c =

6

Enter the RHS function:36

G =

36

f =

p(n + 2) - 5\*p(n + 1) + 6\*p(n) - 36

fZT =

5\*z\*p(0) - 5\*z\*ztrans(p(n), n, z) - (36\*z)/(z - 1) - z\*p(1) + z^2\*ztrans(p(n), n, z) - z^2\*p(0) + 6\*ztrans(p(n), n, z)

fZT =

6\*pZT - (36\*z)/(z - 1) + 5\*z\*p(0) - z\*p(1) - 5\*pZT\*z - z^2\*p(0) + pZT\*z^2

pZT =

((36\*z)/(z - 1) - 5\*z\*p(0) + z\*p(1) + z^2\*p(0))/(z^2 - 5\*z + 6)

pSol =

(3^n/3 - kroneckerDelta(n, 0)/3)\*(3\*p(1) - 6\*p(0) + 54) - (2^n/2 - kroneckerDelta(n, 0)/2)\*(2\*p(1) - 6\*p(0) + 72) + p(0)\*kroneckerDelta(n, 0) - 18\*kroneckerDelta(n, 0) + 18

pSol =

3\*2^n\*p(0) - 2^n\*p(1) - 2\*3^n\*p(0) + 3^n\*p(1) - 36\*2^n + 18\*3^n + 18

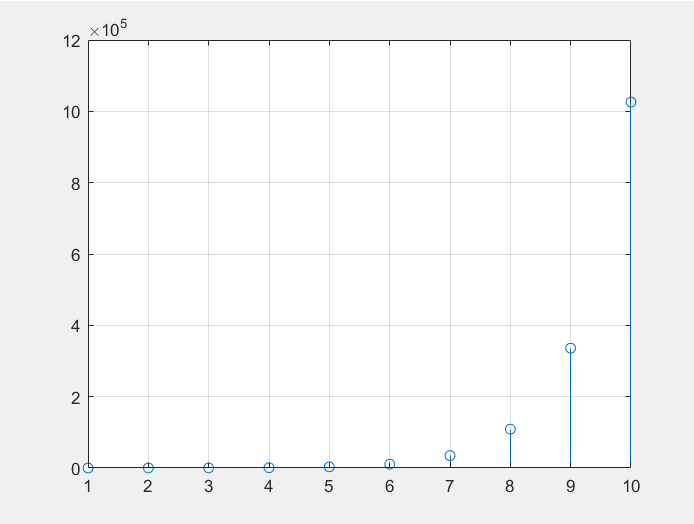
Enter the value of p\_0:0

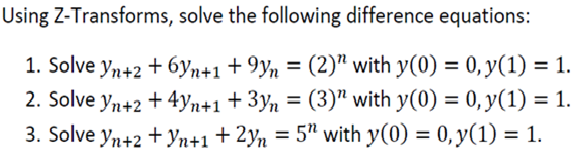
Enter the value of p\_1:0

Solution of the difference equation is given by:

pSol =

18\*3^n - 36\*2^n + 18





1. Enter the coefficient of p\_n+2:1

a =

1

Enter the coefficient of p\_n+1:6

b =

6

Enter the coefficient of p\_n:9

c =

9

Enter the RHS function:2^n

G =

2^n

f =

6\*p(n + 1) + p(n + 2) + 9\*p(n) - 2^n

fZT =

6\*z\*ztrans(p(n), n, z) - z/(z - 2) - 6\*z\*p(0) - z\*p(1) + z^2\*ztrans(p(n), n, z) - z^2\*p(0) + 9\*ztrans(p(n), n, z)

fZT =

9\*pZT - z/(z - 2) - 6\*z\*p(0) - z\*p(1) + 6\*pZT\*z - z^2\*p(0) + pZT\*z^2

pZT =

(z/(z - 2) + 6\*z\*p(0) + z\*p(1) + z^2\*p(0))/(z^2 + 6\*z + 9)

pSol =

p(0)\*kroneckerDelta(n, 0) + 2^n/25 - kroneckerDelta(n, 0)/25 - (kroneckerDelta(n, 0)/9 + ((-3)^n\*(n - 1))/9)\*(9\*p(0) + 3\*p(1) - 3/5) - ((-3)^n/3 - kroneckerDelta(n, 0)/3)\*(p(1) - 2/25)

pSol =

((-3)^n\*n)/15 + (-3)^n\*p(0) + 2^n/25 - (-3)^n/25 - (-3)^n\*n\*p(0) - ((-3)^n\*n\*p(1))/3

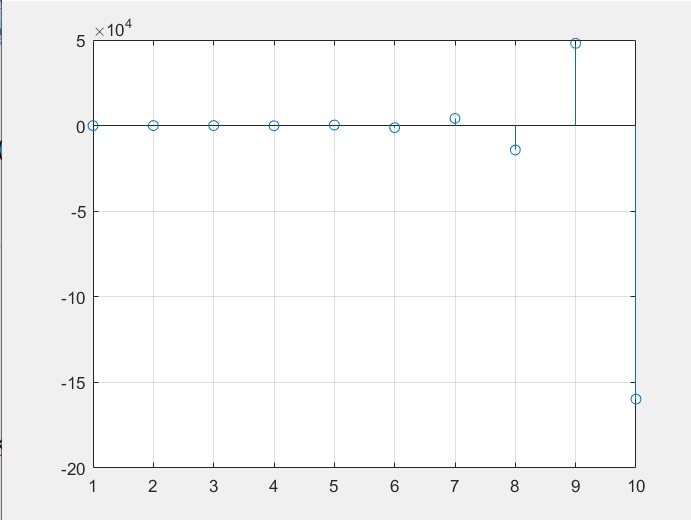
Enter the value of p\_0:0

Enter the value of p\_1:1

Solution of the difference equation is given by:

pSol =

2^n/25 - (4\*(-3)^n\*n)/15 - (-3)^n/25



2. Enter the coefficient of p\_n+2:1

a =

1

Enter the coefficient of p\_n+1:4

b =

4

Enter the coefficient of p\_n:3

c =

3

Enter the RHS function:3^n

G =

3^n

f =

4\*p(n + 1) + p(n + 2) + 3\*p(n) - 3^n

fZT =

4\*z\*ztrans(p(n), n, z) - z/(z - 3) - 4\*z\*p(0) - z\*p(1) + z^2\*ztrans(p(n), n, z) - z^2\*p(0) + 3\*ztrans(p(n), n, z)

fZT =

3\*pZT - z/(z - 3) - 4\*z\*p(0) - z\*p(1) + 4\*pZT\*z - z^2\*p(0) + pZT\*z^2

pZT =

(z/(z - 3) + 4\*z\*p(0) + z\*p(1) + z^2\*p(0))/(z^2 + 4\*z + 3)

pSol =

p(0)\*kroneckerDelta(n, 0) - ((-3)^n/3 - kroneckerDelta(n, 0)/3)\*((3\*p(0))/2 + (3\*p(1))/2 - 1/4) + ((-1)^n - kroneckerDelta(n, 0))\*((3\*p(0))/2 + p(1)/2 - 1/8) + 3^n/24 - kroneckerDelta(n, 0)/24

pSol =

(3\*(-1)^n\*p(0))/2 + ((-1)^n\*p(1))/2 - ((-3)^n\*p(0))/2 - ((-3)^n\*p(1))/2 - (-1)^n/8 + (-3)^n/12 + 3^n/24

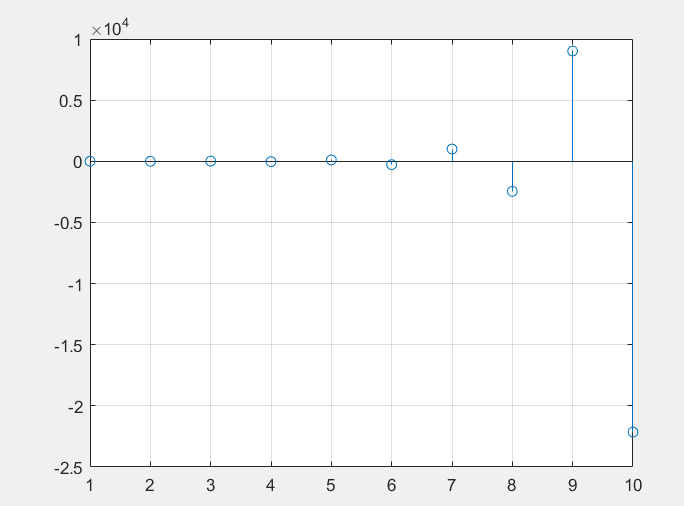
Enter the value of p\_0:0

Enter the value of p\_1:1

Solution of the difference equation is given by:

pSol =

(3\*(-1)^n)/8 - (5\*(-3)^n)/12 + 3^n/24



3) Enter the coefficient of p\_n+2:1

a =

1

Enter the coefficient of p\_n+1:1

b =

1

Enter the coefficient of p\_n:2

c =

2

Enter the RHS function:5^n

G =

5^n

f =

p(n + 1) + p(n + 2) + 2\*p(n) - 5^n

fZT =

z\*ztrans(p(n), n, z) - z/(z - 5) - z\*p(0) - z\*p(1) + z^2\*ztrans(p(n), n, z) - z^2\*p(0) + 2\*ztrans(p(n), n, z)

fZT =

2\*pZT - z/(z - 5) - z\*p(0) - z\*p(1) + pZT\*z - z^2\*p(0) + pZT\*z^2

pZT =

(z/(z - 5) + z\*p(0) + z\*p(1) + z^2\*p(0))/(z^2 + z + 2)

pSol =

p(0)\*kroneckerDelta(n, 0) - (p(0) - 1/32)\*kroneckerDelta(n, 0) + 5^n/32 - kroneckerDelta(n, 0)/32 - ((-1)^n\*7^(1/2)\*(1/2 - (7^(1/2)\*1i)/2)^(n - 1)\*(p(0) + 2\*p(1) - 11/32)\*2i)/7 + ((-1)^n\*7^(1/2)\*((7^(1/2)\*1i)/2 + 1/2)^(n - 1)\*(p(0) + 2\*p(1) - 11/32)\*2i)/7 - (2\*(-1)^n\*2^n\*cos(n\*acos(2^(1/2)/4))\*(p(1) - 5/32))/2^(n/2)

pSol =

p(0)\*kroneckerDelta(n, 0) - (p(0) - 1/32)\*kroneckerDelta(n, 0) + 5^n/32 - kroneckerDelta(n, 0)/32 - ((-1)^n\*7^(1/2)\*(1/2 - (7^(1/2)\*1i)/2)^(n - 1)\*(p(0) + 2\*p(1) - 11/32)\*2i)/7 + ((-1)^n\*7^(1/2)\*((7^(1/2)\*1i)/2 + 1/2)^(n - 1)\*(p(0) + 2\*p(1) - 11/32)\*2i)/7 - (2\*(-1)^n\*2^n\*cos(n\*acos(2^(1/2)/4))\*(p(1) - 5/32))/2^(n/2)

Enter the value of p\_0:0

Enter the value of p\_1:1

Solution of the difference equation is given by:

pSol =

5^n/32 - ((-1)^n\*7^(1/2)\*(1/2 - (7^(1/2)\*1i)/2)^(n - 1)\*53i)/112 + ((-1)^n\*7^(1/2)\*((7^(1/2)\*1i)/2 + 1/2)^(n - 1)\*53i)/112 - (27\*(-1)^n\*2^n\*cos(n\*acos(2^(1/2)/4)))/(16\*2^(n/2))

