

VIT UNIVERSITY

APPLICATIONS OF DIFFERENTIAL EQUATIONS

MAT2002

experiment-9

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1. Solve the difference equation $y_{n+2} - 2y_{n+1} + y_n = 0$, $y_0 = 0$, $y_1 = 1$ using Z-Transform and execute it using MAT Lab.

CODE:

```
clear all
clc
syms n z Y
y2=sym('y(n+2)');
y1=sym('y(n+1)');
y0=sym('y(n)');
a=input('the coefficient of y(n+2)=');
b=input('the coefficient of y(n+1)=');
c=input('the coefficient of y(n)=');
nh=input('the nonhomogeneous part=');
eqn=a*y2+b*y1+c*y0-nh;
ZTY=ztrans(eqn, n, z);
if a==0
d=input('the initial value y(0) is=');
ZTY=subs(ZTY,{'ztrans(y(n), n, z)', 'y(0)'},{Y, d});
else
d=input('the initial value y(0) is=');
e=input('the initial value y(1) is=');
ZTY=subs(ZTY,{'ztrans(y(n), n, z)', 'y(0)', 'y(1)'},{Y, d, e});
end
eq =collect(ZTY,Y);
Y=simplify(solve(eq, Y));
y=simplify(iztrans(Y, z, n))
```

INPUT:

the coefficient of y(n+2)=1
the coefficient of y(n+1)=-2
the coefficient of y(n)=1
the nonhomogeneous part=0
the initial value y(0) is=0
the initial value y(1) is=1

output:

y = n

```
the coefficient of y(n+2)=1
the coefficient of y(n+1)=-2
the coefficient of y(n)=1
the nonhomogeneous part=0
the initial value y(0) is=0
the initial value y(1) is=1
```

```
y =
|
n
```

2. Solve the difference equation $y_{n+2} + 6y_{n+1} + 8y_n = 0$, $y_0 = 0$, $y_1 = 1$ using Z-Transform and execute it using MAT Lab.

CODE:

```
clear all
clc
syms n z Y
y2=sym('y(n+2)');
y1=sym('y(n+1)');
y0=sym('y(n)');
a=input('the coefficient of y(n+2)=');
b=input('the coefficient of y(n+1)=');
c=input('the coefficient of y(n)=');
nh=input('the nonhomogeneous part=');
eqn=a*y2+b*y1+c*y0-nh;
ZTY=ztrans(eqn, n, z);
if a==0
d=input('the initial value y(0) is=');
ZTY=subs(ZTY,{'ztrans(y(n), n ,z)','y(0)'},{Y, d});
else
d=input('the initial value y(0) is=');
e=input('the initial value y(1) is=');
ZTY=subs(ZTY,{'ztrans(y(n), n, z)','y(0)','y(1)'},{Y, d, e});
end
eq =collect(ZTY,Y);
Y=simplify(solve(eq, Y));
y=simplify(iztrans(Y, z, n))
```

INPUT:

```
the coefficient of y(n+2)=1
the coefficient of y(n+1)=6
the coefficient of y(n)=8
the nonhomogeneous part=0
the initial value y(0) is=0
the initial value y(1) is=1
```

OUTPUT:

$$y = (-2)^{n/2} - (-4)^{n/2}$$

the coefficient of $y(n+2)=1$
the coefficient of $y(n+1)=6$
the coefficient of $y(n)=8$
the nonhomogeneous part=0
the initial value $y(0)$ is=0
the initial value $y(1)$ is=1

|
y =

$$(-2)^{n/2} - (-4)^{n/2}$$