```
import·numpy·as·np
import·sympy·as·sp
from matplotlib import pyplot as plt
```

```
z = sp.symbols('z')
k1,k2,k3,k4 = sp.symbols(['k1','k2','k3','k4'])
S = k2*z**2+k3*z+k4
R = k1*(z-1)*(z-0.8)
B = (z+1)*(z-0.8)
A = (z-0.9)*z
```

```
xi =0.5
wn = 2
s = -xi*wn+1j*wn*np.sqrt(1-xi**2)
T = 0.1
z1 = np.exp(s*T)
np.poly([z1,np.conj(z1)])
```

```
array([ 1.        , -1.78259751,  0.81873075])
```

```
M=sp.expand(sp.numer(sp.simplify(1+(B*S/(A*R)))))
M=sp.collect(M,z)
print(M)
MM = sp.collect(sp.expand((z**2-1.78*z+0.82)*z),z)
print(MM)
```

```
k4 + z**3*(k1 + k2) + z**2*(-1.9*k1 + k2 + k3) + z*(0.9*k1 + k3 + k4)
z**3 - 1.78*z**2 + 0.82*z
```

```
eq=[M.coeff(z,n=p)-MM.coeff(z,n=p) for p in range(4)]
sol=sp.solve(eq)
sol
```

```
{k1: 0.947368421052632,
 k2: 0.0526315789473684,
 k3: -0.0326315789473684,
 k4: 0.0}
```

```
C=S.subs(sol)/R.subs(sol)
C.normal()
```

$$\frac{0.0555555555555556 z^{2} - 0.0344444444444444 z}{\left(z - 1\right) \left(z - 0.8\right)}$$