LAB PRACTICE # 3

Basic Control Functions

Transfer Function

$$G(S) = \frac{100}{S^2+14S+100}$$

This transfer function can be stored into the MATLAB

num = 100;
den = [1 14 100];

To check your entry you can use the command *printsys* **as shown below:**

printsys(num,den);

Poles & Zeros

We can find poles with the help of following MATLAB command.

poles = roots(den)

We can find Zeros with the help of following MATLAB command

zeros = roots(num)

contd….. Poles & Zeros

We can plot the poles of the above transfer function marked by the symbol ‘x’.

plot(poles,’x’)

To plot the poles and zeros of any transfer function there is a built in function *pzmap* in the MATLAB

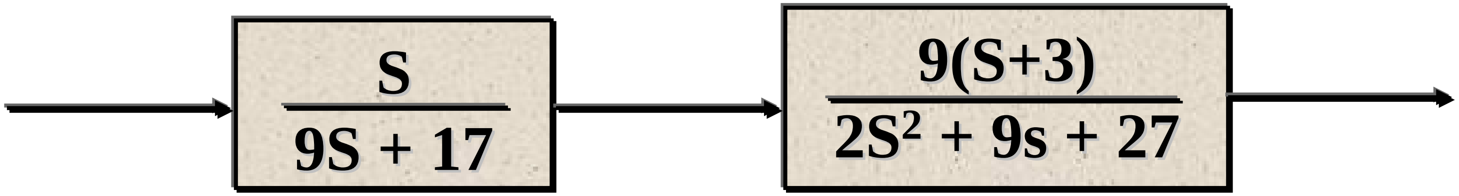
pzmap(num,den)

contd….. Poles & Zeros

Exercise: **For the transfer function given below plot the pole-zero map.**

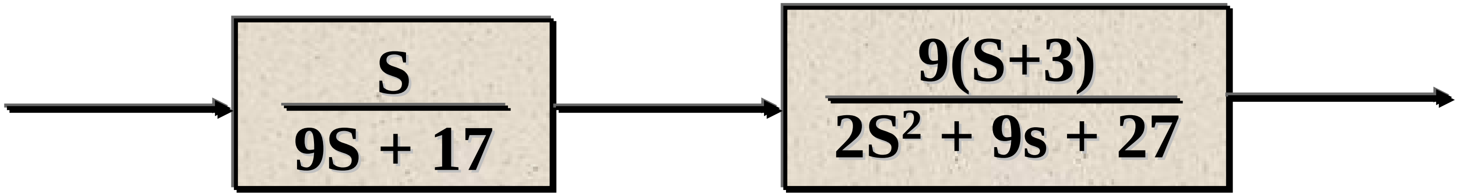
$$G(S) = \frac{S^2 + 3S + 5}{S^3 + 4S + 10}$$

Multiplication of transfer functions




```
num1 = [1  0];
den1 = [9  17];
num2 = 9*[1  3];
den2 =  [2  9  27];
[num12, den12] = series (num1,den1,num2,den2);s
printsys(num12,den12);
```

Contd… Multiplication of transfer functions

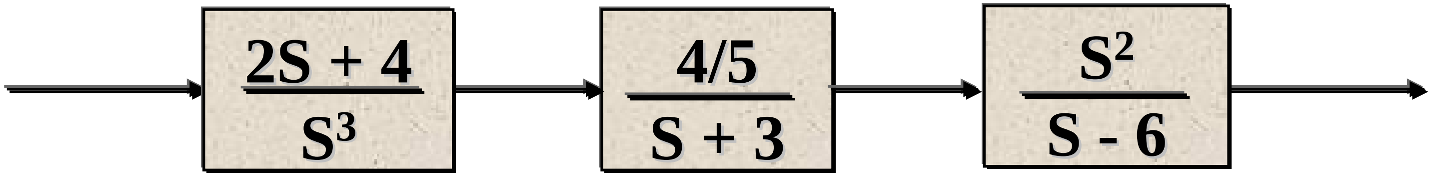



```
num1 = [1  0];
den1 = [9  17];
num2 = 9*[1  3];
den2 =  [2  9  27];
num12 =conv(num1,num2);
den12 = conv(,den1,den2);
printsys(num12,den12);
```

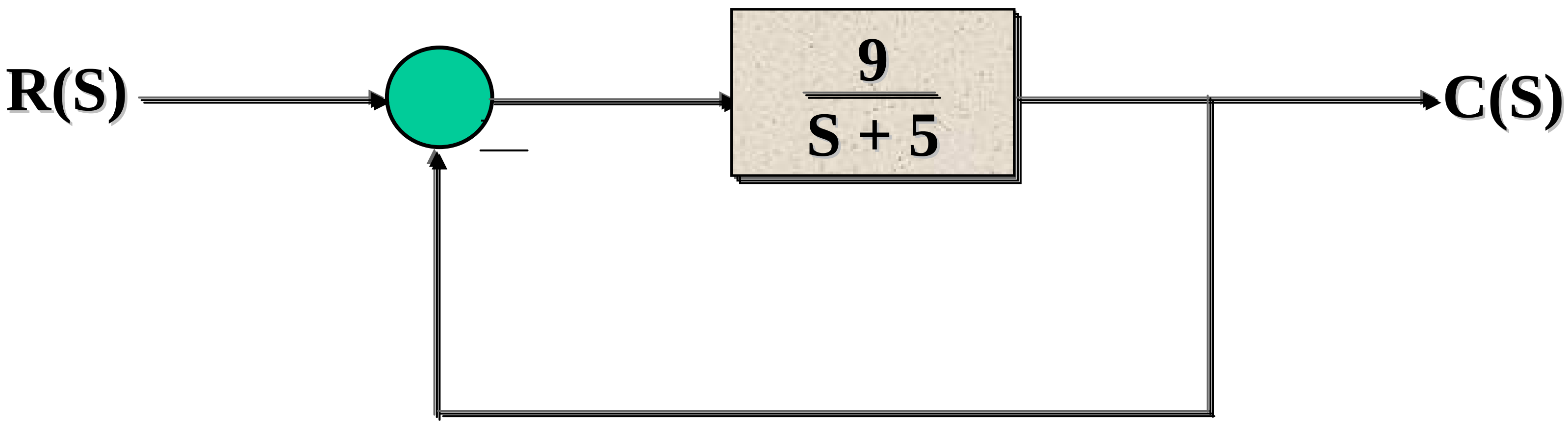
Contd… Multiplication of transfer functions

Exercise:

Reduce following block diagram into a single block form. Find poles and zeros and sketch pole zero diagram.

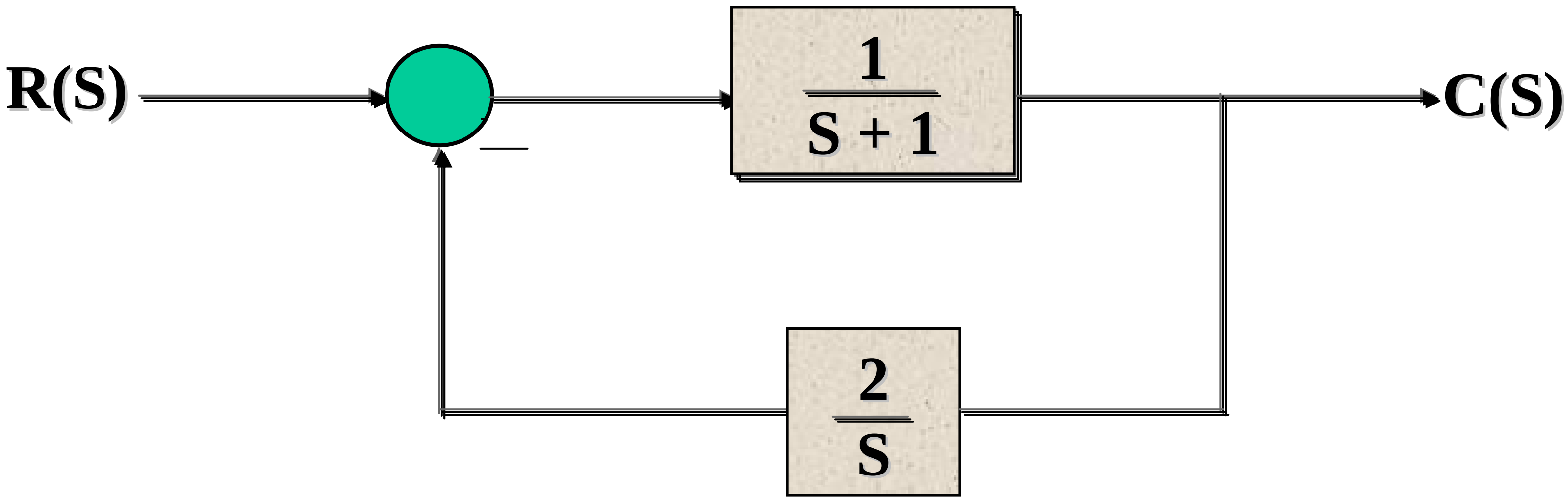


Closed-loop transfer function



num = 9;
den = [1   5];
[numcl,dencl] = cloop(num,den,-1);
printsys(numcl,dencl)

Contd… Closed-loop transfer function




```
num1 = 1;
den1 = [1   1];
num2 = 2;
den2 = [1   0];
[numcl,dencl] = feedback(num1,den1,num2,den2);
printsys(numcl,dencl)
```

Contd… **Closed-loop transfer function**

Exercise:

Find the closed loop transfer function of the block diagram shown below