Ministry of Higher Education And Scientific Research

AL-Mustaqbal University College

Department of Computer Engineering Techniques

Control Foundations

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Experiment no.2: Open loop and closed loop control system

More matlab programs in control systems:

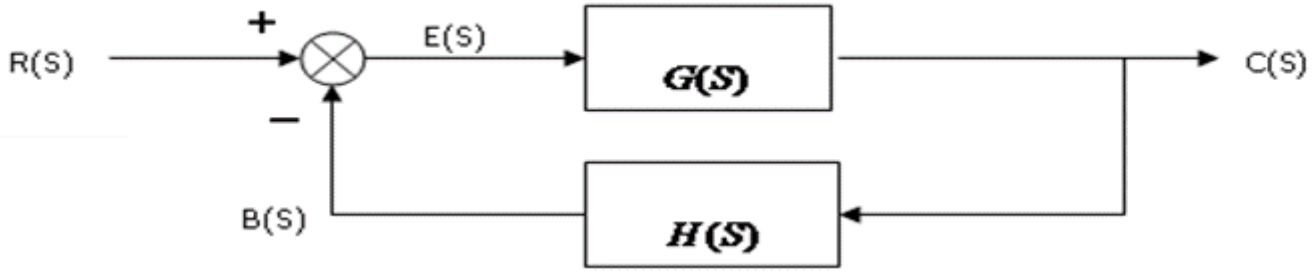
Object:

To learn the open – loop and closed – loop control system properties by using Matlab / Simulink .

Procedure:

1-Run Matlab by selecting [Start] → [All programs] →[Matlab]→Simulink

2-By using library of Simulink can be connected the open-loop and closed-loop control system shown below.

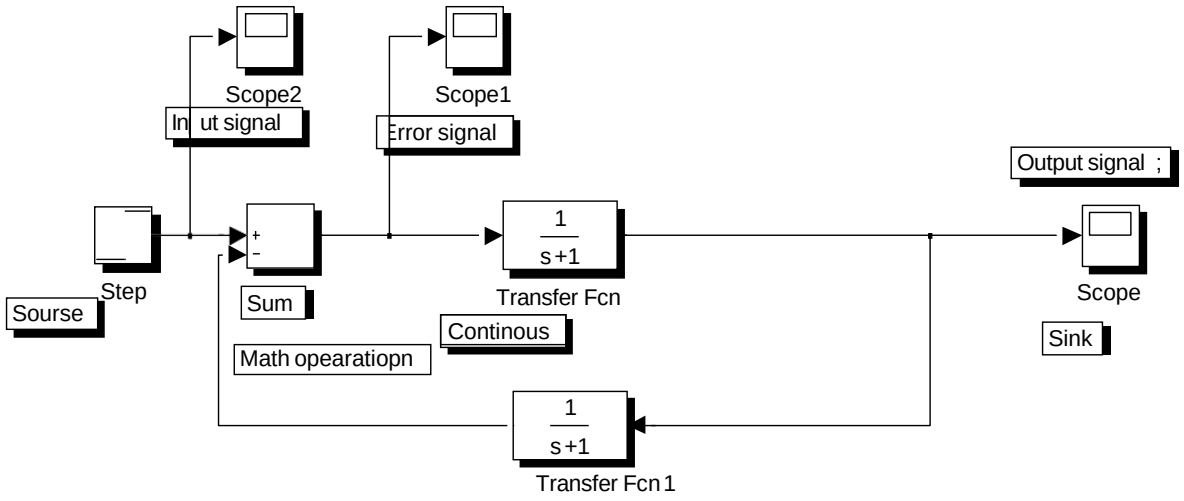


Closed loop control system

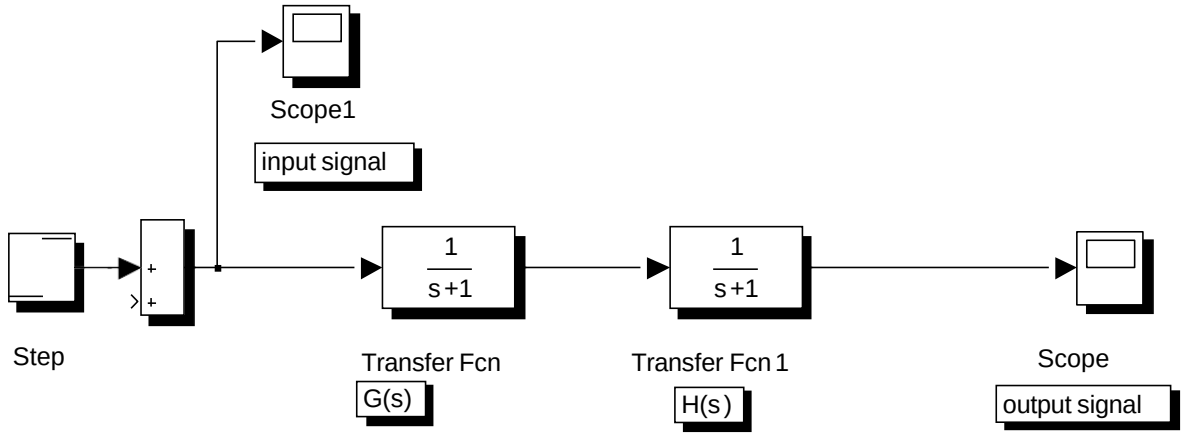
Where G(s) : feed forward transfer function

H(s) : feedback transfer function

- The input R(s) is unit step
- The output is show on the scope



Closed loop control system simulated in MATLAB/ Simulink –ve & +ve Feedback



Open loop control system simulated in MATLAB/ Simulink

Cases:

$$1\text{-}\,G(s) = \frac{10}{S^2 + 4s + 10} \quad ; H(s) = 1;$$

$$2 - G(s) = \frac{9s}{S^2 + 7s + 15} \quad ; H(s) = 5;$$

$$3 - G(s) = \frac{s+5}{(s+3)(S^2+8)} \quad ; H(s) = \frac{1}{s+7};$$

$$4 - G(s) = \frac{12s}{S^3 + 17s + 20}; \quad H(s) = \frac{s}{s+6}$$

Discussions:

1-Discusse the response for each case ?
2-what the mean different between open loop & closed loop control system
2-What the best Response for all cases?

Experiment no.3: Block Reduction

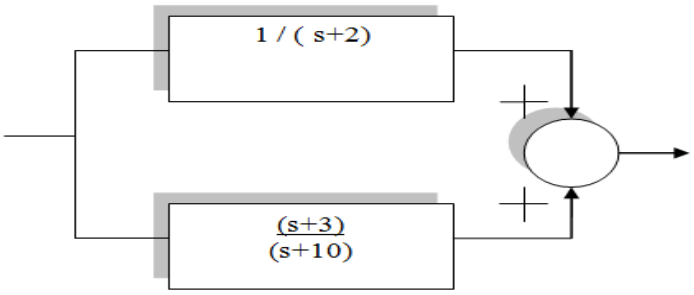
More matlab programs in control systems:

Object:

Using a matlab program to implement a parallel, serial and feedback connections between block diagrams to represent the desired control systems.

Instructions :

(1). For parallel connections as in example shown below:

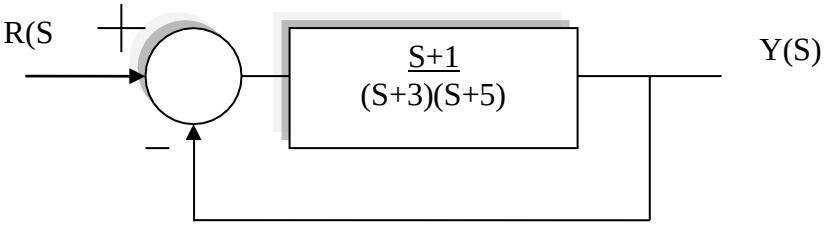


program :

```
n1=[1]; d1=[1 2];
n2=[1 3];d2=[1 10];
[nh , dh]=parallel(n1,d1,n2,d2);
printsys(nh,dh,'s');
```

so T.F.= $\frac{S^2 + 6S + 18}{S^2 + 12 S + 20}$

(2).for unity feedback block diagram as in the example shown below:

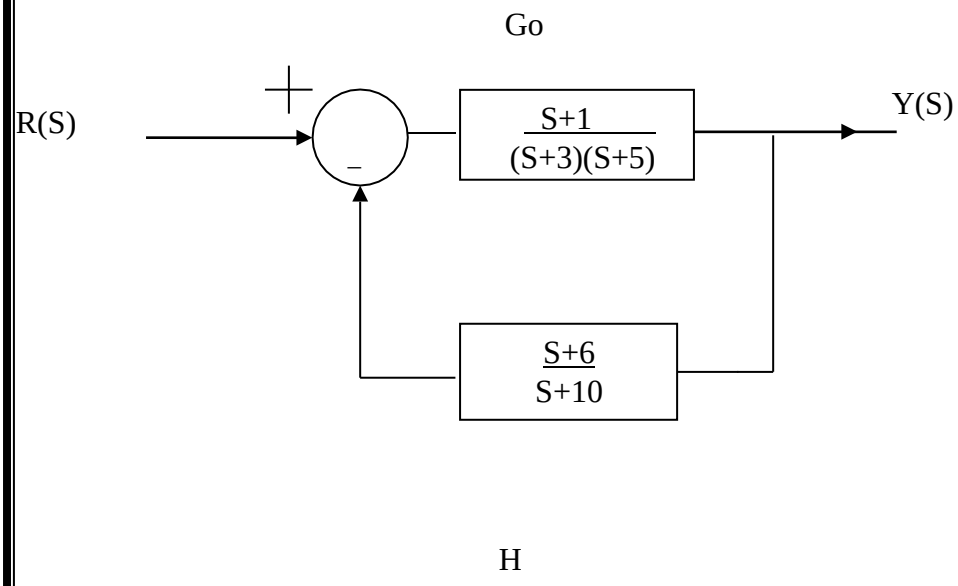


Program:

```
N=[1  1]; d=conv([1  3] , [1  5]);
[nh , dh]=cloop(n , d);
printsys(nh , dh , 'S');
```

so T.F.= $\frac{S + 1}{S^2 + 9S + 1}$

(3).when feedback is not unity , as in the example shown below :

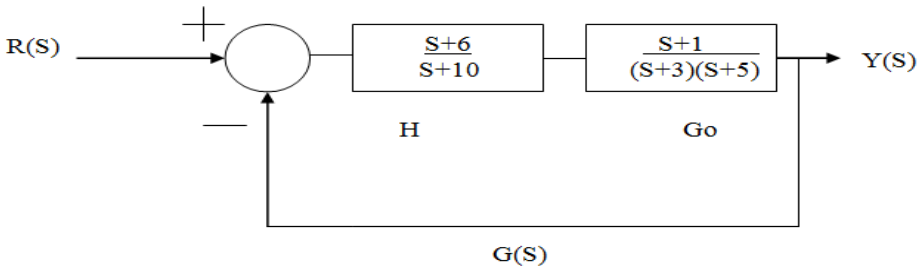


Program:

```
Ngo=[1  1];
Dgo=conv([1  3] , [1 5]);
Nh=[1  6] ; dh=[1  10];
[ng , dg]=feedback(ngo , dgo , nh ,
dh);printsys(ng , dg , 'S');
```

so T.F.= $\frac{S^2 + 11S + 10}{S^3+19S^2+102S+156}$

(4). For serial connection ,as in the example shown below :



Program :

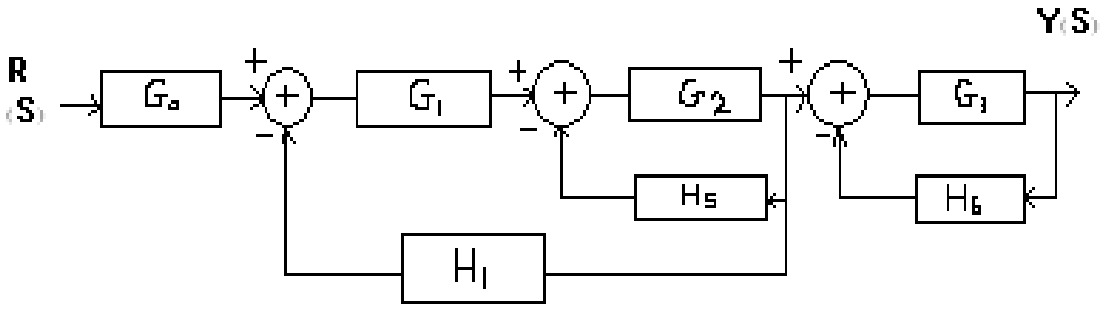
```
Ngo =[1  1];
Dgo =conv([1  3] , [1  5]);
Nh =[1  6];
Dh =[1  10];
[ns , ds]=series(Nh,Dh,Ngo,Dgo);
[ng,dg]=cloop(nS,dS);

printsys(ng,dg,'S');
```

CLASS WORK

1- Write a program to find the overall transfer function of the following blockdiagram:

Go=1 , G1=1/(S+2) , G2=1/(S+2) ,G3=1/(S+3)H4=4 ,H5=8 ,H6=12



2-Reduce the above block diagram to single block by using rules (Theoretical).3-Compare between the theoretical solution and the results of program.