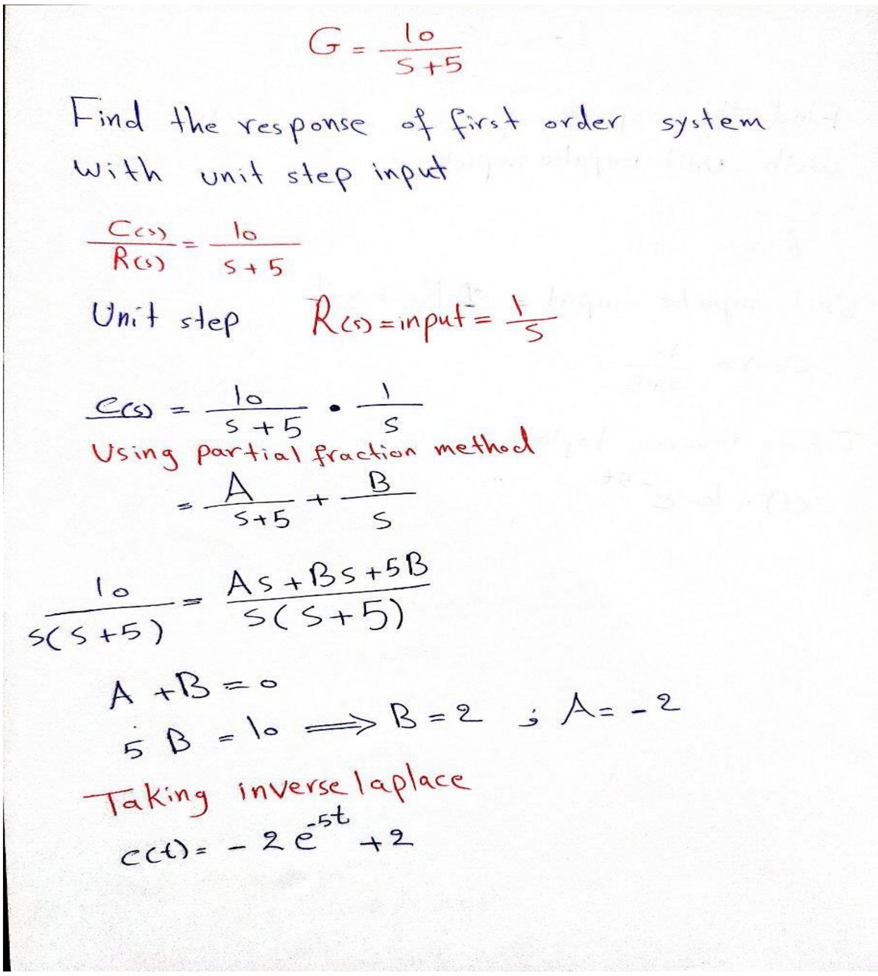
EXPERMINT NO.1

***R**esponse **O**f **F**irst **O**rder **S**ystem*

Unit-Step Response of the Transfer-Function system can found in two ways :

1.1 Find the response of first order system with unit step input

$$G=\frac{10}{S+5}$$



$$G=\frac{10}{s+5}$$

Find the response of first order system with unit step input

$$\frac{C(s)}{R(s)}=\frac{10}{s+5}$$

Unit step $R(s)=\text{input}=\frac{1}{s}$

$$C(s)=\frac{10}{s+5}\cdot\frac{1}{s}$$

Using partial fraction method

$$=\frac{A}{s+5}+\frac{B}{s}$$

$$\frac{10}{s(s+5)}=\frac{As+Bs+5B}{s(s+5)}$$

$A+B=0$

$5B=10 \Longrightarrow B=2$; $A=-2$

Taking inverse laplace

$$c(t)=-2e^{-5t}+2$$

```
clear all
close all
clc

t=0:0.1:5     %time invariant
C=-2*exp(-5*t)+2;   %Responce pf the first order system
plot(t,C)      %ploting of the responce
```

1.2 By using step command

```
clear all
close all
clc

t=0:0.1:5     %time invariant
num=[10];
den=[1 5];
g=tf(num,den)
step(g,t)
```

Unit-Impulse Response of the Transfer-Function System can be in two ways:

2.1 find the response of first order system with unit impulse input

$$G=\frac{10}{S+5}$$

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Find the response of first order system with unit impulse input

$$\frac{C(s)}{R(s)}=\frac{10}{s+5}$$

Unit impulse = input = $R(s)=1$

$$C(s)=\frac{10}{s+5}$$

Taking inverse laplace

$$c(t)=10\,e^{-5t}$$

```
clear all
close all
clc

t=0:0.1:5     %time invariant
C=10*exp(-5*t);   %Responce pf the first order system
plot(t,C)      %ploting of the responce
```

2.2 By using step command

```
clear all
close all
clc

t=0:0.1:5     %time invariant
num=[10];
den=[1 5];
g=tf(num,den);
impulse(g,t)
```

Unit-Ramp Response of the Transfer-Function System can be in two ways:

3.1 find response of first order system with unit ramp input

$$G=\frac{10}{S+5}$$

$$G=\frac{10}{s+5}$$

Find the response of first order system with Unit ramp input

$$\frac{C(s)}{R(s)}=\frac{10}{s+5}$$

Unit ramp input $R(s)=\frac{1}{s^2}$

$$C(s)=\frac{10}{s+5}\cdot\frac{1}{s^2}$$

Using partial fraction method

$$=\frac{A}{s+5}+\frac{B}{s}+\frac{C}{s^2}$$

$$\frac{10}{s^2(s+5)}=\frac{As^2+B(s^2+5s)+C(s+5)}{s^2(s+5)}$$

$$\frac{10}{s^2(s+5)}=\frac{As^2+Bs^2+5Bs+Cs+5C}{s^2(s+5)}$$

$10=5C \Longrightarrow C=2$

$5B+C=0 \Rightarrow B=-0.4$

$A+B=0 \Rightarrow A=0.4$

Taking inverse laplace

$$c(t)=0.4e^{-5t}-0.4+2t$$

```
close all
clc

t=0:0.1:10; %time invariat
C=0.4*exp(-5*t)-0.4+2*t;  %Responce pf the first order
system
plot(t,C)
```

3.2 By using step command

```
clear all
close all
clc

s=tf('s');
t=0:0.1:5    %time invariant
num=[10];
den=[1 5];
g=tf(num,den)
step(g/s,t)
```