Signals and Systems Laboratory (EC2P002)

EXPERIMENT-7

LAPLACE TRANSFORM

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AIM:

To show that the inbuilt Laplace function is same as the one made by us.

THEORY:

The Laplace transform of function $f(t)$, defined for all real numbers $t \geq 0$, is the function $F(s)$, which is a unilateral transform defined by

$$\mathbf{H(s) = \int_{-inf}^{inf} (t) * e^{-st} dt.}$$

where s is a complex number frequency parameter s

$= \sigma + i\omega$, with real numbers σ and ω.

Q. Find the Laplace transform of the following signals.

a. sin(at)

b. cos(bt)

c. unit step signal u(t)

d. unit impulse signal δ(t)

e. ramp signal r(t)

f. triangular signal

g. rectangular pulse signal

h. exponential signal

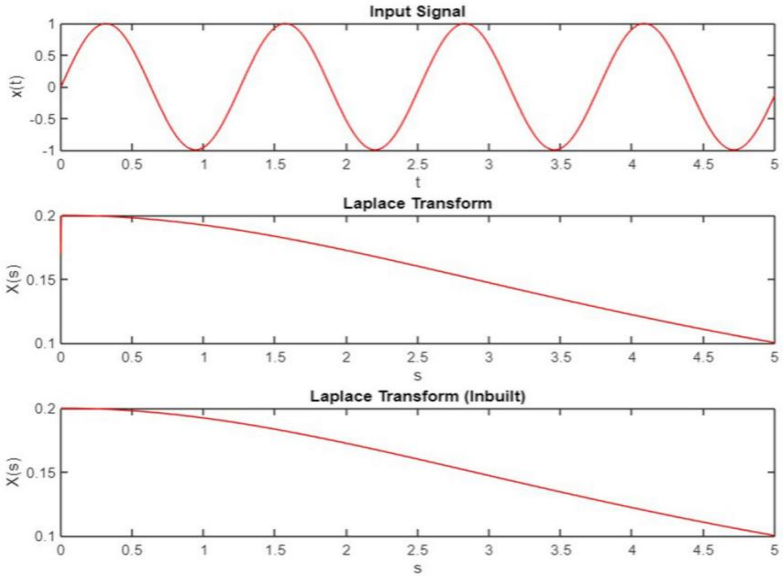
i. damped sine signal

j. damped cosine signal

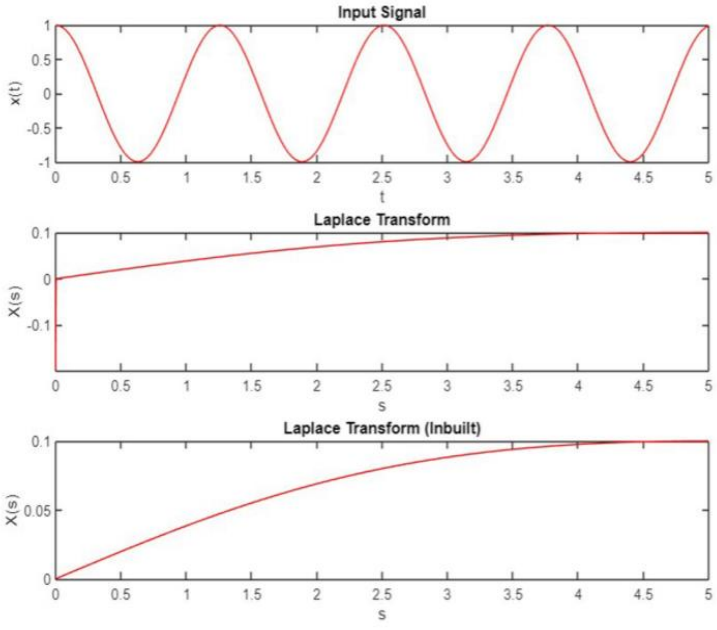
Compare the results of your code with the result of inbuilt Laplace transform

RESULTS:

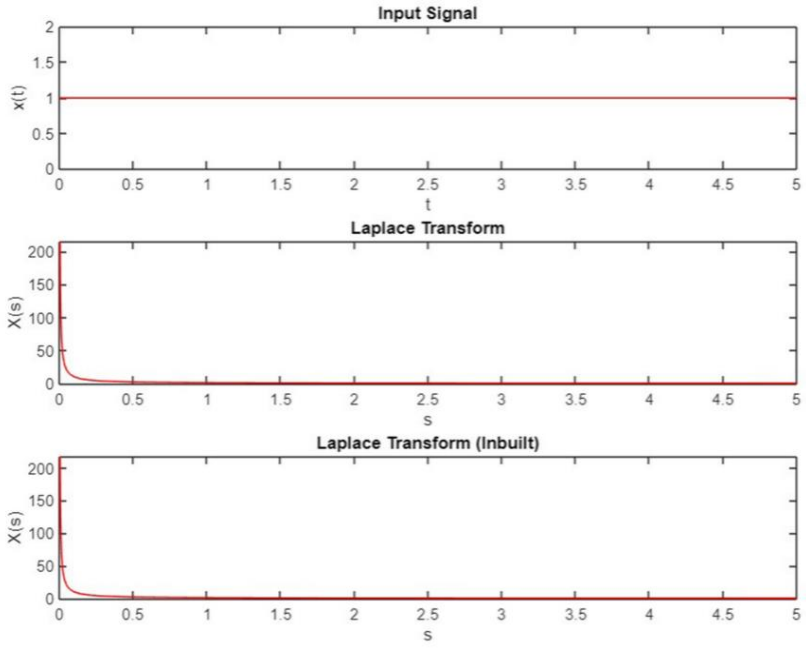
Sin(a*t)



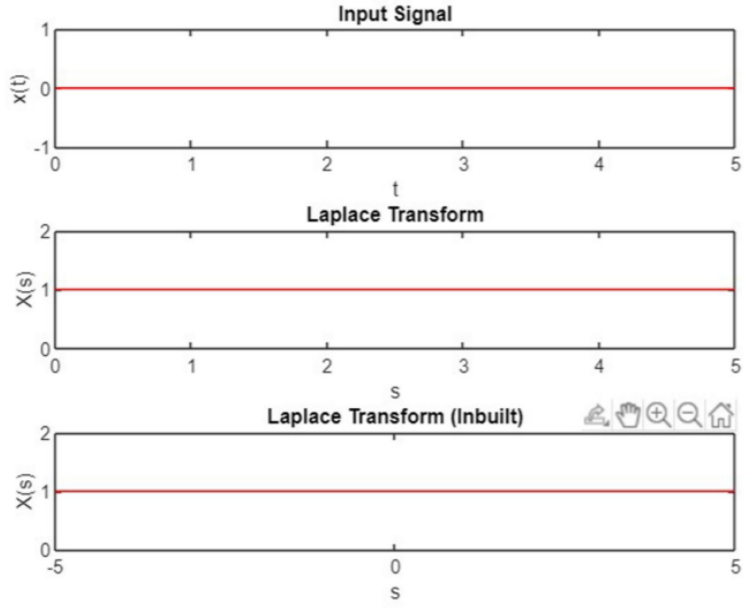
Cos(a*t)



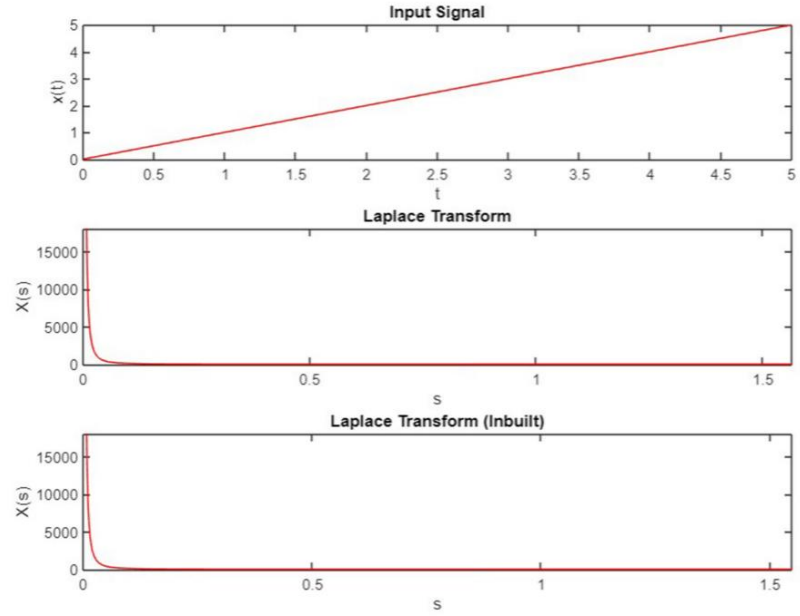
Unit Step



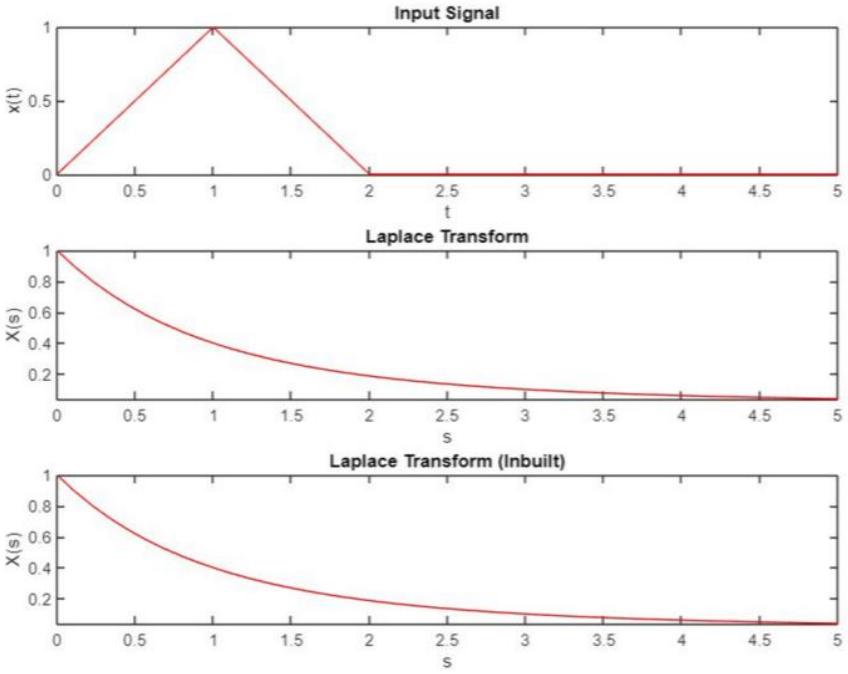
unit impulse signal



ramp signal

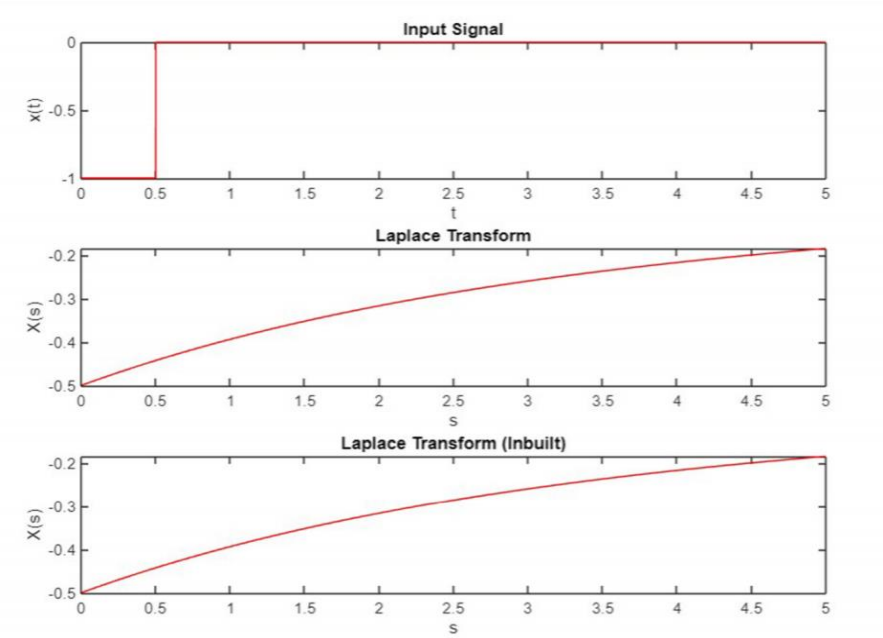


triangular signal

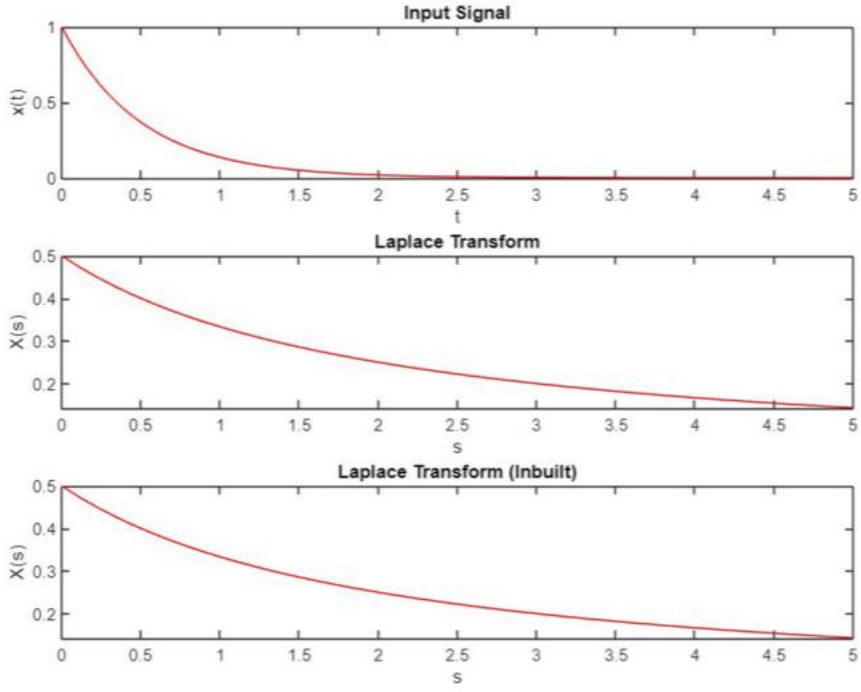


a
k
c
a)

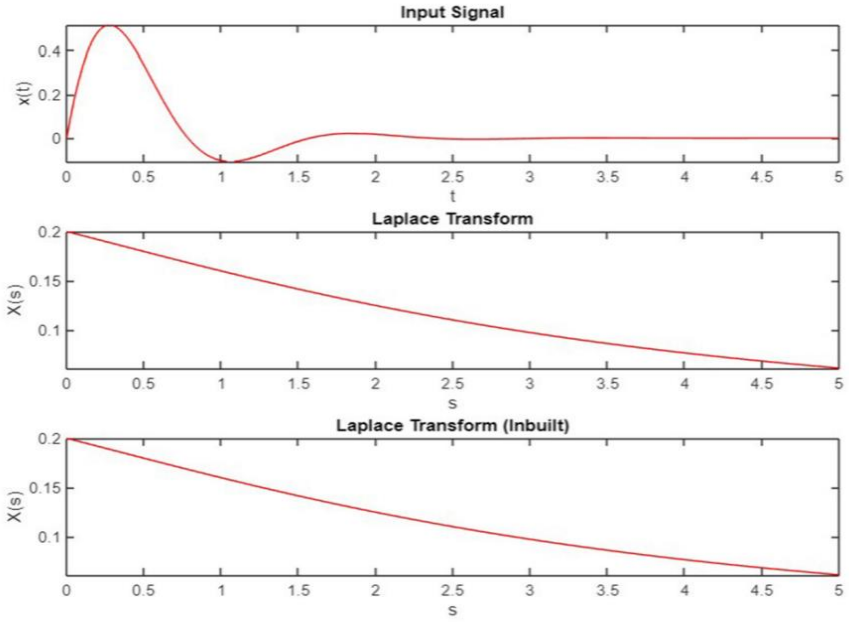
rectangular signal



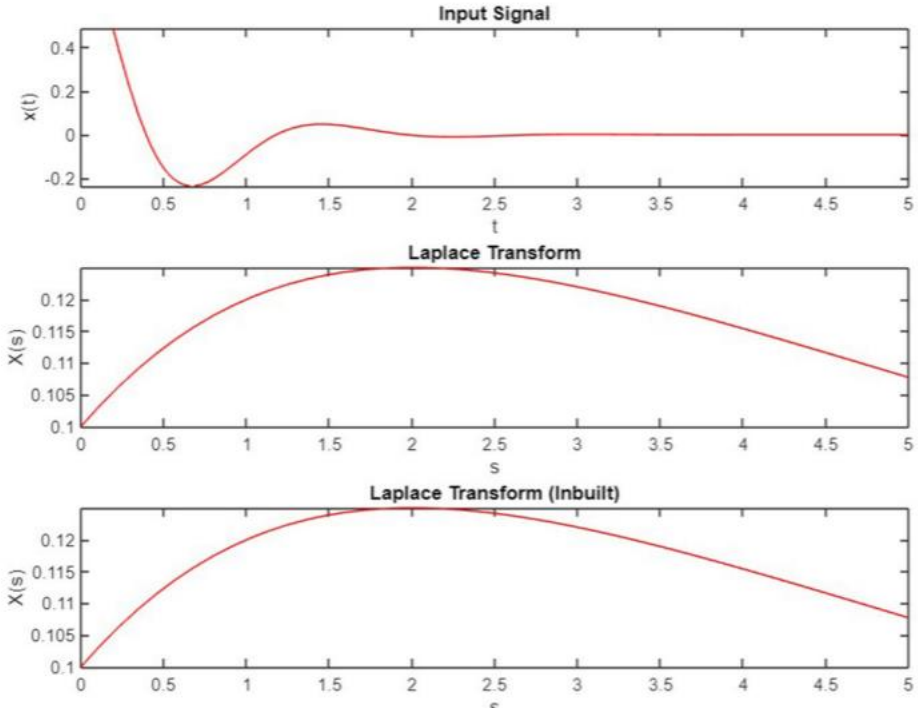
exponential signal



damped sine signal



damped cosine signal



DISCUSSION

Here we have just seen the Laplace transform of basic signals. We showed that the Laplace we made is equal to the one from inbuilt. The main purpose of Laplace transform is to solve differential equations.

CONCLUSION

In this experiment we thus performed unilateral Laplace transform of various signals with and without using inbuilt function. This gave us a clearer understanding on the topic. Laplace Transform is widely used by electronic engineers to solve quickly differential equations occurring in the analysis of electronic circuits. Laplace Transform is used to simplify calculations in system modelling, where large number of differential equations are used.

APPENDIX

```
syms t s
a=5; b=3;
c=input("Enter serial number of the question ");
u(t) = piecewise(t>=0,1,0);

if(c==1)
x(t) = sin(a*t);
elseif(c==2)
x(t) = cos(b*t);
elseif(c==3)
x(t) = heaviside(t);
elseif(c==4)
x(t) = piecewise(t==0,inf,0);
elseif(c==5)
x(t) = t*heaviside(t);
elseif(c==6)
x(t) = triangularPulse(t);
elseif(c==7)
x(t) = rectangularPulse(t);
elseif(c==8)
x(t) = exp(-a*t);
elseif(c==9)
x(t) = exp(-t).*sin(b*t);
elseif(c==10)
x(t) = exp(-b*t).*cos(b*t);
end

subplot(2,2,1);
fplot(x(t),'Linewidth',2);
xlabel("time-->");
ylabel("x(t)");
title("Input Signal x(t)");
L = @(s) int(x(t)*exp((-s)*t),t,0,100000);
disp("Value of integration without using in-built function is");
disp(L(s));
disp("Value of integration by using in-built function is");
disp(laplace(x,t,s));
subplot(2,2,2);
fplot((L(s)),[0,5],'Linewidth',2);
%axis([0 5 0.1 0.2]);
xlabel("s-->"); ylabel("F(s)"); title("F(s) without using inbuilt function");
subplot(2,2,3);
fplot(laplace(x),[0,5],'Linewidth',2);
xlabel("s-->"); ylabel("F(s)"); title("F(s) by using inbuilt function");
```