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% Name: Lamin Jammeh
% Class: EE480 Online
% Semster: Fall 2023
% MIDTERM

%% ********** Q2 *********
t = 0:0.1:1;
x_t = t;
x_t3 = t/3;
subplot(2,1,1)
plot(t,x_t);
title('X(t Q2)');
xlabel('t');
grid on;
subplot(2,1,2)
plot(t,x_t3);
title('X(t/3) Q2');
xlabel('t');
grid on;

% x(t) is compressed by 1/3 on the y-axis

%% ********** Q3 x(t) & p(t) *********
clear;
clc;
syms t s;
p_t = 20*(heaviside(t) - heaviside(t-40)) - 10*(heaviside(t-40)-heaviside(t-60));
P = 1.1*abs(min(p_t))
x_t = (p_t + P)*cos(2*pi*t)
subplot(2,1,1)
fplot(p_t,[0,100],'r',"LineWidth",2); % Plot x(t) as a function plot
xlabel('Time (sec)');
ylabel("p(t)");
title("p(t) for 0<=t<=100");

subplot(2,1,2)
fplot(x_t,[0,100],'r',"LineWidth",2); % Plot x(t) as a function plot
xlabel('Time (sec)');
ylabel("x(t)");
title("x(t) for 0<=t<=100");
%% ********** Q3 y(t) *********
clear;
clc;
syms t s;
p_t = 20*(heaviside(t) - heaviside(t-40)) - 10*(heaviside(t-40)-heaviside(t-60));
P = 1.1*abs(min(p_t))
x_t = (p_t + P)*cos(2*pi*t)
y_t = abs(x_t)
fplot(y_t,[0,100],'r',"LineWidth",2); % Plot x(t) as a function plot
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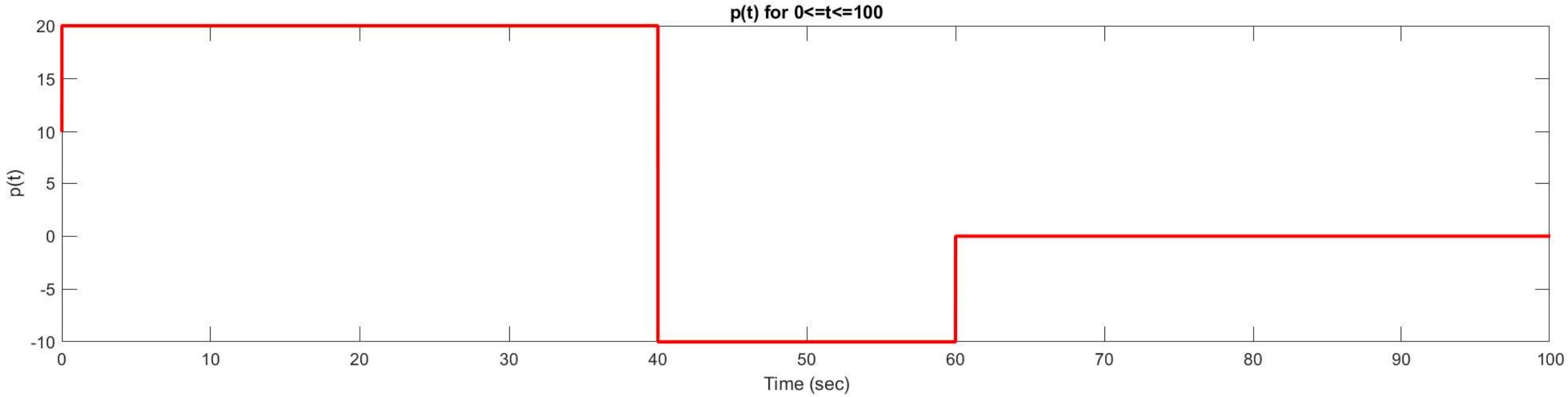
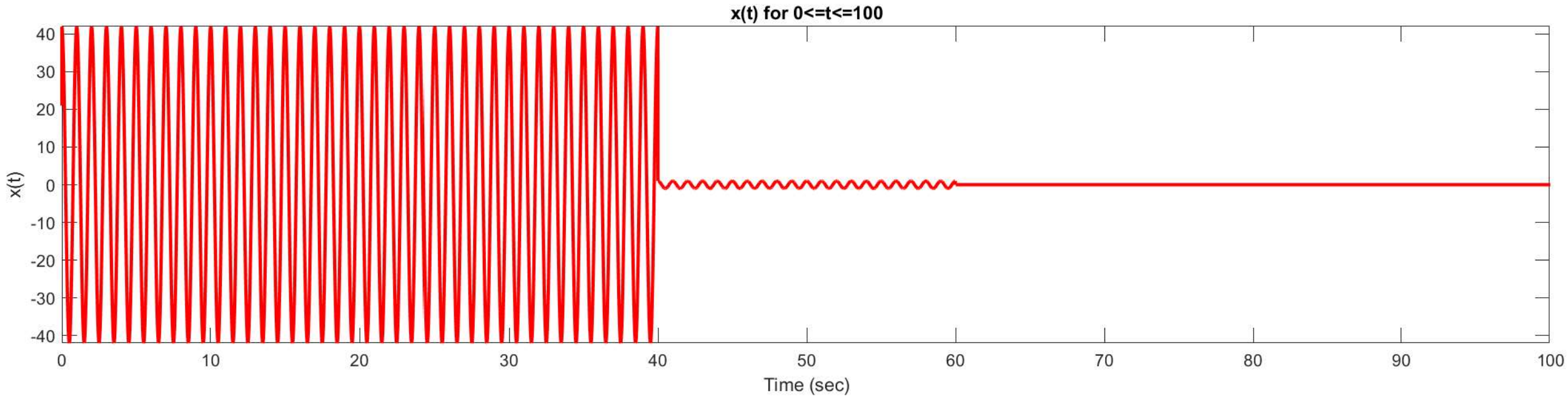
xlabel('Time (sec)');
ylabel("y(t)");
title("y(t) for 0<=t<=100");
ylim([-1,45]) % assign limits to y axis

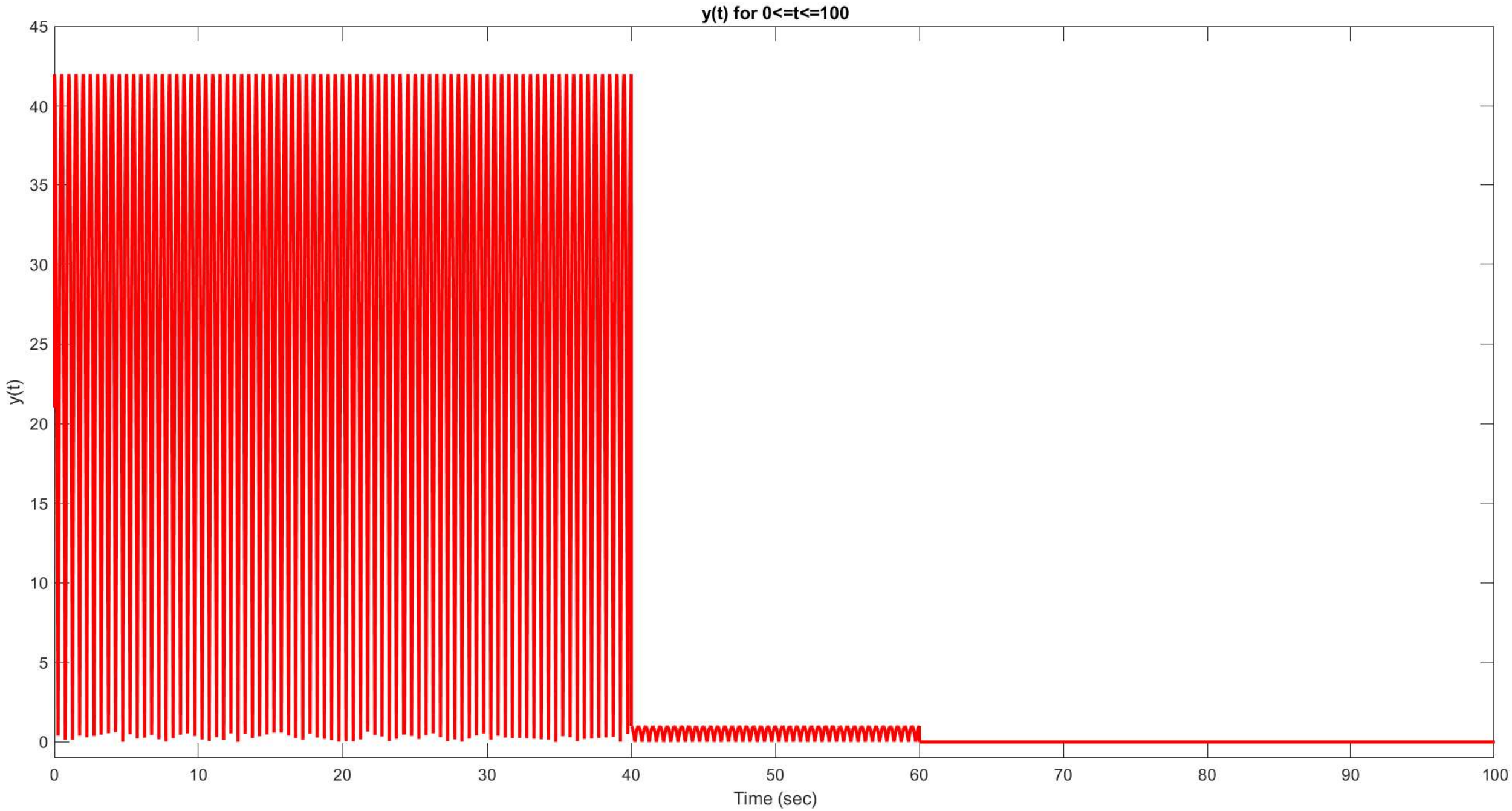
%% ********** Q3 z(t) *********
clear;
clc;
syms t s;
p_t = 20*(heaviside(t) - heaviside(t-40)) - 10*(heaviside(t-40)-heaviside(t-60));
P = 1.1*abs(min(p_t))
x_t = (p_t + P)*cos(2*pi*t)
y_t = abs(x_t)
T_s = 0.01;
h_t = exp(-0.8*t)*heaviside(t)
% i wil be using the Transfer function with Laplace for Low Pass (z(t)

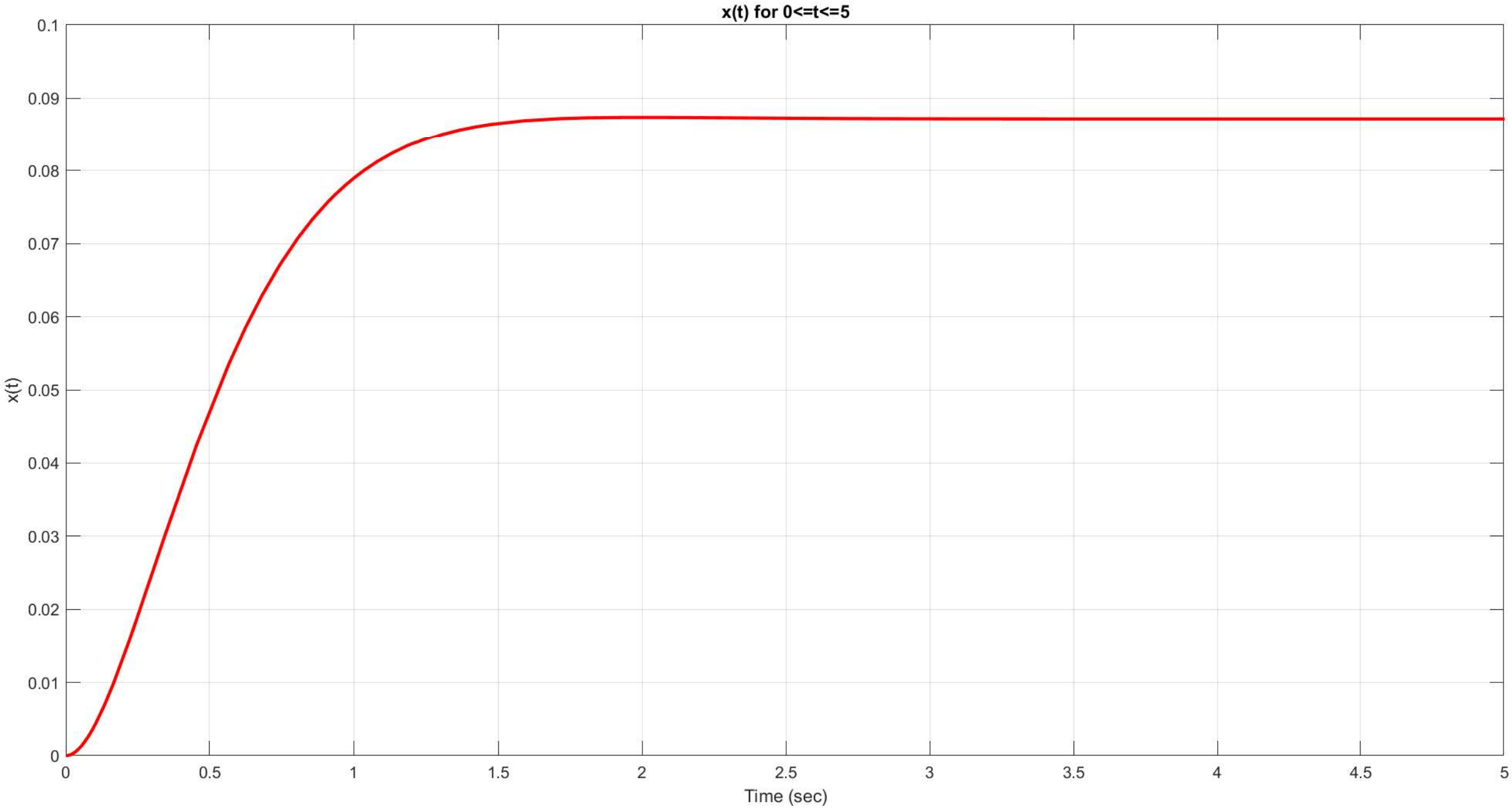
% step 1 Y(s)
Y_s = laplace(y_t);
H_s = laplace(h_t);
Z_s = H_s * Y_s
z_t = ilaplace(Z_s)

%% ********** Q4 **********
clear;
clc;
syms t s;
m = pi/2
X_s = 1 / ((s+3-j*(m))*(s+3+j*(m))*(s));
x_t = ilaplace(X_s)
fplot(x_t,[0,5],'r',"LineWidth",2); % Plot x(t) as a function plot
xlabel('Time (sec)');
ylabel("x(t)");
title("x(t) for 0<=t<=5");
ylim([0,0.1]) % assign limits to y axis
grid on;
```


p(t) for 0<=t<=100
p(t)
Time (sec)
20
15
10
5
0
-5
-10
0
10
20
30
40
50
60
70
80
90
100


x(t) for 0<=t<=100
x(t)
Time (sec)
40
30
20
10
0
-10
-20
-30
-40
0
10
20
30
40
50
60
70
80
90
100


y(t) for 0<=t<=100
y(t)
Time (sec)
45
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100


x(t) for 0<=t<=5
x(t)
Time (sec)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

Q5

Saturday, October 21, 2023 9:06 AM

$$y''(t) + 0.5\,y'(t) + 0.15\,y(t) = x(t)$$

$y'(0) = 1$ & $y(0) = 1$ $\quad x(t) = u(t)$

$$y''(0) + 0.5\,y'(0) + 0.15\,y(0) = u(t)$$

$$y''(0) + 0.5 + 0.15 = u(t)$$

$$y''(0) + 0.65 = u(t)$$

$$y''(0) = u(t) - 0.65$$

$$\frac{d^2}{dt^2} y(0) = u(t) - 0.65$$