MATLAB EXPERIMENT-8

Lateral Vibration of Hanging Rope

Name:SHOURYA BANERJEE
17BEE0326

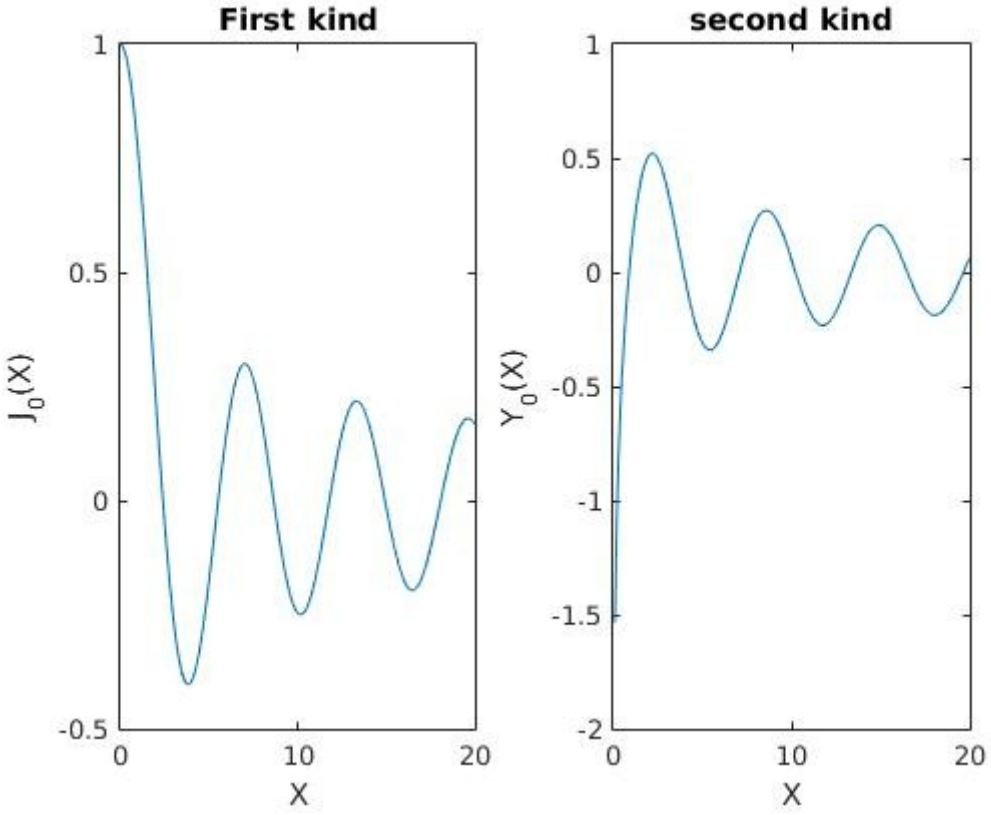
MATLAB CODE:

```
clc
clear all
syms x a0 a1 a2 a3 a4 m c1 c2
y=a0*x^m+a1*x^(m+1)+a2*x^(m+2)
                    +a3*x^(m+3)+a4*x^(m+4)
eq=x^2*diff(y,x,2)+x*diff(y,x,1)+x^2*y
eq1=collect(eq)
eq2=coeffs(simplify(eq1*x^(1-m)),x)
eq3=solve(eq2(1),m)
a1=solve(eq2(2),a1)
a2=solve(eq2(3),a2)
a3=subs(solve(eq2(4),a3))
a4=subs(solve(eq2(5),a4))
ss=a0*x^m+a1*x^(m+1)+a2*x^(m+2)
                     +a3*x^(m+3)+a4*x^(m+4)
y1=subs(ss,m,eq3(1))
y2=subs(diff(ss,m),m,eq3(1))
gs=c1*y1+c2*y2
X = 0:0.1:20;
Y = zeros(5,numel(X));
J = zeros(5,numel(X));
Y0 = bessely(0,X);
J0=besselj(0,X);
subplot(1,2,1),plot(X,J0)
title('First kind')
xlabel('X')
ylabel('J_0(X)')
subplot(1,2,2),plot(X,Y0)
title('second kind')
xlabel('X')
ylabel('Y_0(X)')
```

OUTPUT:

```
y =a0*x^m + a1*x^(m + 1) + a2*x^(m + 2)
ans =a3*x^(m + 3) + a4*x^(m + 4)
eq =x*(a2*x^(m + 1)*(m + 2) + a0*m*x^(m - 1) + a1*x^m*(m + 1)) + x^2*(a0*x^m + a1*x^(m + 1) + a2*x^(m + 2)) + x^2*(a0*m*x^(m - 2)*(m - 1) + a1*m*x^(m - 1)*(m + 1) + a2*x^m*(m + 1)*(m + 2))

eq1 =(a0*x^m + a1*x^(m + 1) + a2*x^(m + 2) + a0*m*x^(m - 2)*(m - 1) + a1*m*x^(m - 1)*(m + 1) + a2*x^m*(m + 1)*(m + 2))*x^2 + (a2*x^(m + 1)*(m + 2) + a0*m*x^(m - 1) + a1*x^m*(m + 1))*x

eq2 =[ a0*m^2, a1*m^2 + 2*a1*m + a1, a2*m^2 + 4*a2*m + a0 + 4*a2, a1, a2]
eq3 = 0
     0
a1 = 0
a2 =-a0/(m^2 + 4*m + 4)
a3 =Empty sym: 0-by-1
a4 =Empty sym: 0-by-1
ss =a0*x^m - (a0*x^(m + 2))/(m^2 + 4*m + 4)
ans =Empty sym: 0-by-1
y1 =

a0 - (a0*x^2)/4


y2 =

(a0*x^2)/4 + a0*log(x) - (a0*x^2*log(x))/4


gs =

c1*(a0 - (a0*x^2)/4) + c2*((a0*x^2)/4 + a0*log(x) - (a0*x^2*log(x))/4)
```

GRAPH:


First kind
1
0.5
0
-0.5
$J_0(X)$
0
10
20
X
second kind
1
0.5
0
-0.5
-1
-1.5
-2
$Y_0(X)$
0
10
20
X