

LAB ASSIGNMENT – 1

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COURSE CODE	MAT2002
COURSE NAME	APPLICATIONS OF DIFFERENTIAL AND DIFFERENCE EQUATIONS
SLOT	L1+L2
FACULTY	UMA K

EXPERIMENT 1(A): FOURIER SERIES

MATLAB CODE:-

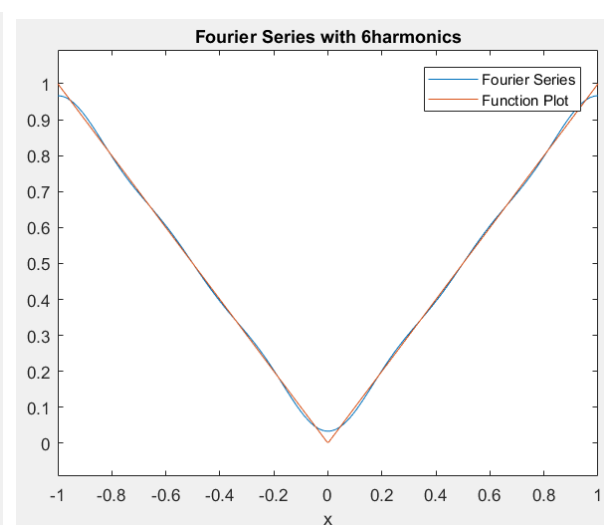
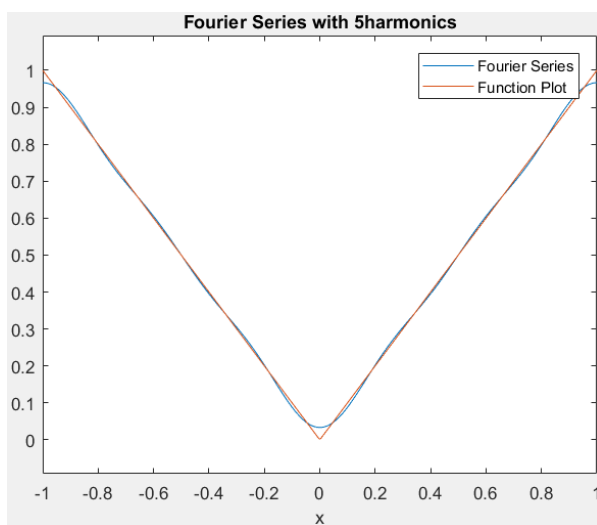
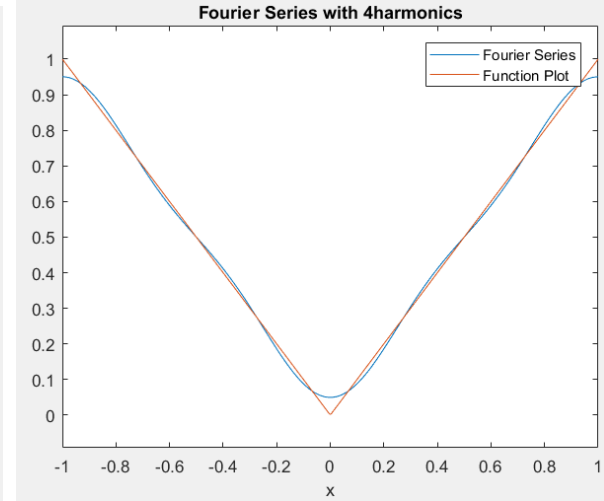
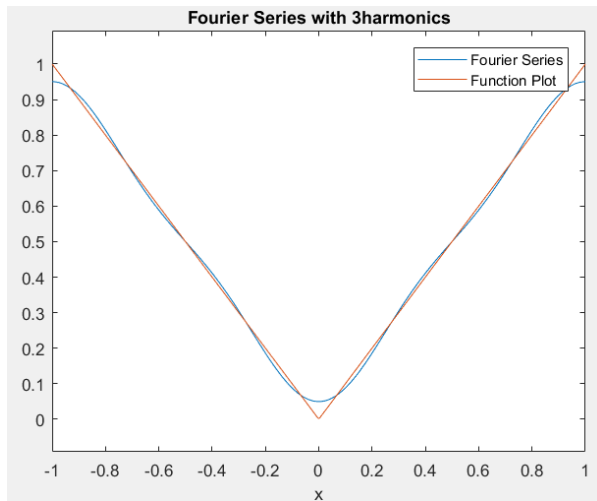
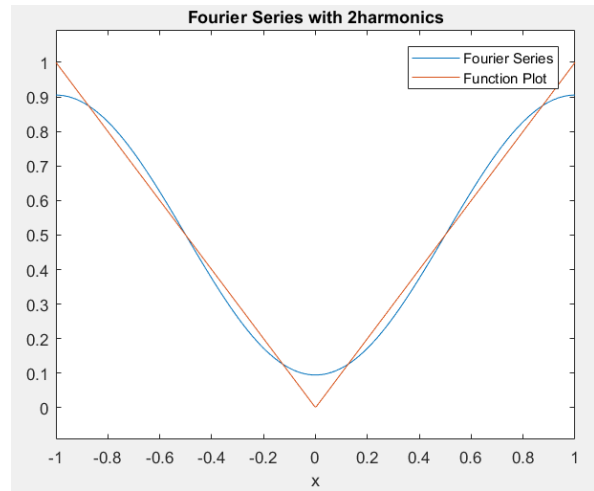
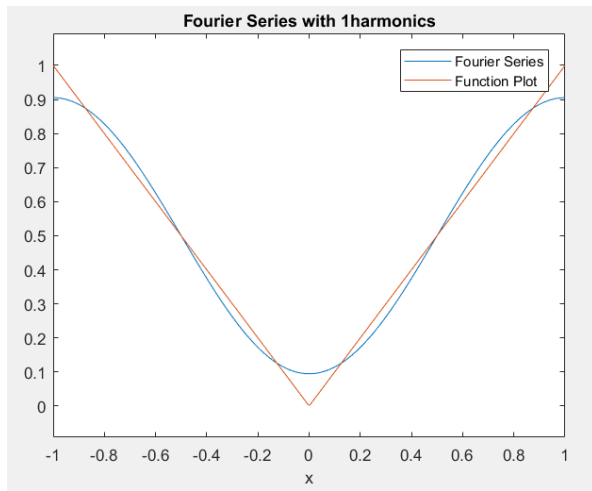
```
1 - clear all
2 - close all
3 - clc
4 - syms x
5 - f =input('Enter the function of x: ');
6 - I=input('Enter the interval of [a,b]: ');
7 - m=input('Enter the number of Harmonics required: ');
8 - a=I(1);b=I(2);
9 - L=(b-a)/2;
10 - a0=(1/L)*int(f,a,b);
11 - Fx=a0/2;
12 - for n=1:m
13 -     figure;
14 -     an(n)=(1/L)*int(f*cos(n*pi*x/L),a,b);
15 -     bn(n)=(1/L)*int(f*sin(n*pi*x/L),a,b);
16 -     Fx=Fx+an(n)*cos(n*pi*x/L)+bn(n)*sin(n*pi*x/L);
17 -     Fx=vpa(Fx,4);
18 -     ezplot(Fx,[a,b]);
19 -     hold on
20 -     ezplot(f,[a,b]);
21 -     title(['Fourier Series with ', num2str( n ) , 'harmonics']);
22 -     legend('Fourier Series', 'Function Plot');
23 -     hold off
24 - end
25 - disp(strcat('Fourier series with', num2str(n), 'harmonics is:',char(Fx)))
```

INPUT/OUTPUT:-

Command Window

```
Enter the function of x: abs(x)
Enter the interval of [a,b]: [-1,1]
Enter the number of Harmonics required: 6
Fourier series with6harmonics is:0.5 - 0.4053*cos(3.142*x) - 0.01621*cos(15.71*x) - 0.04503*cos(9.425*x)
```

FIGURE:-



EXPERIMENT 1(B): HARMONIC ANALYSIS

MATLAB CODE:-

```
1 - clear all
2 - clc
3 - syms t
4 - x=input('Enter the equally spaced values of x: ');
5 - y=input('Enter the values of y=f(x): ');
6 - m=input('Enter the number of harmonics required: ');
7 - n=length(x); a=x(1); b=x(n);
8 - h=x(2)-x(1);
9 - L=(b-a+h)/2;
10 - theta=pi*x/L;
11 - a0=(2/n)*sum(y);
12 - Fx=a0/2; x1=linspace(a,b,100);
13 - for i=1:m
14 -     figure
15 -     an=(2/n)*sum(y.*cos(i*theta));
16 -     bn=(2/n)*sum(y.*sin(i*theta));
17 -     Fx=Fx+an*cos(i*pi*t/L)+bn*sin(i*pi*t/L);
18 -     Fx=vpa(Fx,4);
19 -     Fx1=subs(Fx,t,x1);
20 -     plot(x1,Fx1);
21 -     hold on
22 -     plot(x,y);
23 -     title(['Fourier Series with ',num2str(i),'harmonics'])
24 -     legend('Fourier Series', 'Function Plot')
25 -     hold off;
26 - end
27 - disp(strcat('Fourier series with', num2str(i),'harmonics is:',char(Fx)));
```

INPUT/OUTPUT:-

Command Window

```
Enter the equally spaced values of x: 0:5
Enter the values of y=f(x): [4 8 15 7 6 2]
Enter the number of harmonics required: 4
```

Fourier series with 4 harmonics is: $4.33\sin(1.047t) - 1.5\cos(2.094t) - 1.5\cos(4.189t)$
 $- 2.833\cos(1.047t) - 0.866\sin(2.094t) + 0.866\sin(4.189t) + 2.667\cos(3.142t) - 6.123e-16\sin(3.142t) + 7.0$

FIGURE:-

